THE UNIVERSITY OF SYDNEY

Science Undergraduate **Handbook 2018**

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Contents

Bachelor of Liberal Arts and Science

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These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BPLIARSC-01	Bachelor of Liberal Arts and Science
BHLIARSH-01	Bachelor of Liberal Arts and Science (Honours)

2 Attendance pattern

The attendance pattern for this course is full time or part time according to candidate choice.

3 Admission to candidature

Admission to undergraduate courses at the University of Sydney is either on the basis of completion of secondary study via the NSW Higher School Certificate, leading to the award of an Australian Tertiary Admission Ranking (ATAR) or equivalent (and subject to special admissions provisions as set out in the Coursework Rule), or on the basis of Mature Age Admission as set out in the Admissions chapter of the Coursework Policy.

4 Requirements for award

To qualify for the award of the pass degree, a student must successfully complete 144 credit points, with at least 132 credit points from the Bachelor of Liberal Arts and Science Units Table, Arts Table A or Science Table 1:

COMMON REQUIREMENTS FOR ALL STUDENTS

(1) a minimum of 36 credit points of units listed in the Bachelor of Liberal Arts and Science Units Table; including
- (a) ATHK1001 and WRIT1001; and
- (b) a minimum of 6 credit points of units from Part C Ethics in the Bachelor of Liberal Arts and Science Units Table; and
- (c) the remaining 18 credit points of Liberal Studies units may be taken from any of the six areas of the Bachelor of Liberal Arts and Science Units Table, Parts A-F.

(2) units of study chosen to satisfy requirements of the Bachelor of Liberal Arts and Science Units Table can not count towards the Science or Arts requirements below; and

(3) all students must complete either a Science major or an Arts major:
- (a) For a Science Major
  - (i) a major in Science from Table 1; and
  - (ii) a minimum of 36 credit points of units of study from Arts Table A, which must include at least 12 credit points at Arts senior level (2000 or 3000 level); or
- (b) For an Arts Major
  - (i) a major in Arts from Table A; and
  - (ii) a minimum of 36 credit points of units of study from Science Table 1, which must include at least 12 credit points at Science intermediate or senior level (2000 or 3000 level);

(4) a maximum of 12 credit points from outside of Arts Table A and Science Table 1 may be taken with approval from the relevant Faculty; and

(5) no more than 84 credit points of junior units of study.

5 Majors

(1) Completion of a major is a requirement of the course. Units of study counted towards one major may not count toward any other major.

(2) The list of Table 1 Science majors available is specified in the course resolutions for the Bachelor of Science.

(3) The list of Table A Arts majors available is specified in the resolutions of the Faculty of Arts and Social Sciences.

(4) Units of study counted towards a major may not count toward the Liberal Studies requirements.

6 Requirements for the Honours degree

(1) Honours is available to meritorious candidates who complete an additional year of full time study in either Science or Arts at the completion of the degree.

(2) Admission and award requirements for honours in Science are described in the Coursework Policy and in the resolutions of the Faculty of Science. Admission and award requirements for honours in Arts are described in the resolutions of the Faculty of Arts and Social Sciences.

7 Award of the degree

(1) The Bachelor of Liberal Arts and Science is awarded as either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Third Class according to the requirements of the Coursework Policy, the Resolutions of the Faculty of Science and the resolutions of the Faculty of Arts and Social Sciences.

(2) Candidates for the award of the Honours degree who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

8 Transitional provisions

(1) These resolutions apply to persons who commenced their candidature after 1 January, 2016 and persons who commenced their candidature prior to 1 January, 2016 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2016 may complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that requirements are completed by 1 January, 2020, or later date as the Faculty may, in special circumstances, approve.

(3) Students who commenced their degree prior to 1 January 2018 or who progress according to degree resolutions applicable to students commencing before that date may take major/s from the major/s listed under 'Transitional Provisions' in Table 1.

Please note:

The following course resolution is published subject to approval by the Academic Board on 28 November 2017.

Bachelor of Liberal Arts and Science

Bachelor of Liberal Arts and Science Units Table

Unit of study	***Credit points***	***A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition***	***Session***
Candidates are required to complete 36 credit points from units listed in the Liberal Studies Units Table. ATHK1001 and WRIT1001 and at least one 6 credit point unit of study from Part C Ethics must be completed. The remaining 18 credit points of Liberal Studies units may be taken from any of the six areas of the table, A-F. It is strongly recommended that ATHK1001 and WRIT1001 are taken in the first year of the degree.			
A. Analytical Thinking			
Core units of study			
ATHK1001 **Analytical Thinking**	6	*ATHK1001 is a compulsory unit within the Bachelor of Liberal Arts and Science (BLAS) degree and will only be available to students enrolled in BLAS.*	Semester 1
Elective units of study			
LNGS1001 **Structure of Language**	6		Semester 1
PHIL1012 **Introductory Logic**	6		Intensive July Semester 2
PHIL2615 **Logic and Proof** *This unit of study is not available in 2018*	6	**P** PHIL1012 **N** PHIL2215 or PHIL3215	Semester 2
PHIL2642 **Critical Thinking**	6	**P** 12 Junior credit points	Semester 2
DATA2002 **Data Analytics: Learning from Data**	6	**A** (Basic Linear Algebra and some coding) or QBUS1040 **P** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **N** STAT2012 or STAT2912	Semester 2
Any unit of study in Mathematics and Statistics from the Faculty of Science Table 1 to a maximum of 12 credit points can be counted towards the Liberal Studies requirements.			
B. Communication			
Core units of study			
WRIT1001 **Writing and Rhetoric: Academic Essays**	6		Semester 1 Semester 2 Summer Main
Elective units of study			
ENGL1007 **Language, Texts and Time**	6		Semester 2
LNGS1002 **Language and Social Context**	6		Semester 2
WRIT1000 **Introduction to Academic Writing**	6		Semester 1 Semester 2
WRIT2002 **Arguments that Change the World**	6	**P** 12 Junior credit points	Intensive December Semester 1 Semester 2
Any unit of study in a language subject area other than English, from the Faculty of Arts Table A to a maximum of 12 credit points in languages can be counted towards the Liberal Studies requirements.			
C. Ethics			
HPSC1000 **Bioethics**	6	**N** HPSC1900 *This Junior unit of study is highly recommended to Intermediate and Senior Life Sciences students.*	Intensive July Semester 1 Summer Main
HPSC1900 **Bioethics (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** HPSC1000 *Note: Department permission required for enrolment*	Semester 1
HPSC3107 **Science, Ethics and Society**	6	**P** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **N** HPSC3022 or HPSC3024 or HPSC2011	Semester 1
PHIL1011 **Reality, Ethics and Beauty**	6	**N** PHIL1003 or PHIL1004 or PHIL1006 or PHIL1008	Semester 1
PHIL2617 **Practical Ethics**	6	**P** 12 Junior credit points **N** PHIL2517 or PHIL3617	Semester 2
PHIL2623 **Moral Psychology**	6	**P** 12 Junior credit points in Philosophy **N** PHIL2513 or PHIL3513	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
D. Culture, Society and Global Citizenship			
AMST1001 **Global America**	6	*Students intending to do a major in American Studies must complete AMST1001 and either HSTY1023 or HSTY1076*	Semester 2
ANTH1001 **Cultural Difference: An Introduction**	6	**N** ANTH1003 *Note: Department permission required for enrolment*	Intensive July Semester 1 Summer Main Winter Main
ANTH1002 **Anthropology and the Global**	6	**N** ANTH1004	Semester 2
ANTH2625 **Culture and Development**	6	**P** 12 Junior credit points in Anthropology	Semester 1
ARHT1001 **Style and Substance: Introducing Art History**	6		Semester 1
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
GEOS1901 **Earth, Environment and Society Advanced**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 *Note: Department permission required for enrolment*	Semester 1
GEOS1002 **Introductory Geography**	6	**N** GEOS1902 or GEOG1001 or GEOG1002	Semester 2
GEOS1902 **Introductory Geography (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1002 or GEOG1001 or GEOG1002 *Note: Department permission required for enrolment*	Semester 2
GOVT1202 **World Politics** *This unit of study is not available in 2018*	6	*In Summer School this unit is available to current HSC students only.*	Semester 1 Semester 2 Summer Main
HSTY1044 **Twentieth-Century Europe** *This unit of study is not available in 2018*	6	**N** HSTY1043	Semester 2
INDG1001 **Introduction to Indigenous Cultures**	6		Intensive July Intensive June Semester 1
E. Scientific Enquiry			
ANTH2627 **Medical Anthropology**	6	**P** 12 Junior credit points each in any of Anthropology, Gender Studies or Cultural Studies **N** ANTH2027	Semester 1
HPSC2101 **What Is This Thing Called Science?**	6	**P** 24 credit points of Junior units of study **N** HPSC2901	Semester 2 Summer Main
HPSC2901 **What Is This Thing Called Science? (Adv)**	6	**P** 24 credit points of Junior study with a Distinction average **N** HPSC2101 *Note: Department permission required for enrolment*	Semester 2
HPSC2100 **The Birth of Modern Science**	6	**P** 24 credit points of Junior units of study **N** HPSC2900	Semester 1 Summer Main
HPSC2900 **The Birth of Modern Science (Advanced)**	6	**P** 24 credit points of Junior study with a Distinction average **N** HPSC2100 *Note: Department permission required for enrolment*	Semester 1
PHYS1500 **Astronomy**	6	*No assumed knowledge of Physics.*	Semester 2
F. Technological Literacy			
ARIN2610 **Internet Transformations**	6	**P** 18 Junior credit points in any of Anthropology, Art History, Computer Science, Design Computing, English, Gender and Culture Studies, History, Information Systems, Information Technology, Linguistics, Media and Communication, Philosophy, Psychology or Sociology or 12 credit points at 1000 level in Digital Cultures **N** ARIN2100	Semester 2
ARIN2620 **Cyberworlds**	6	**P** 18 junior credit points in any of Anthropology, Art History, Computer Science, Design Computing, English, Gender and Culture Studies, History, Information Systems, Information Technology, Linguistics, Media and Communication, Philosophy, Psychology or Sociology or 12 credit points at 1000 level in Digital Cultures **N** ARIN2200	Semester 1
ARIN2630 **Digital Arts**	6	**P** 18 junior credit points in any of Anthropology, Art History, Computer Science, Design Computing, English, Gender and Culture Studies, History, Information Systems, Information Technology, Linguistics, Media and Communication, Philosophy, Psychology or Sociology or 12 credit points at 1000 level in Digital Cultures **N** ARIN2300	Semester 2

Bachelor of Psychology

Please note:

The following course resolution is published subject to approval by the Academic Board on 28 November 2017.

Bachelor of Psychology

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course Resolutions

1 Course codes

Code	Course title
BPPSYCHO-02 / BHPSYCHH-01	Bachelor of Psychology

2 Attendance pattern

The attendance pattern for this course is full time or part time according to candidate choice.

3 Admission to candidature

Admission to undergraduate courses at the University of Sydney is either on the basis of completion of secondary study via the NSW Higher School Certificate, leading to the award of an Australian Tertiary Admission Ranking (ATAR) or equivalent (and subject to special admissions provisions as set out in the Coursework Policy).

4 Requirements for award

(1) Students are required to nominate either the Science stream or the Arts and Social Sciences stream upon commencement of candidature.

(2) To qualify for the award of the Bachelor of Psychology, students must successfully complete 192 credit points, comprising all common requirements and units from either Arts and Social Sciences or Science.

(3) *Common requirements for all students*

(a) no more than 60 credit points of junior units of study; and

(i) a minimum of 12 credit points of junior Psychology units of study, with a minimum average mark of 65; and

(ii) 24 credit points of intermediate Psychology units of study (PSYC2010 / PSYC2910, PSYC2012, PSYC2013, PSYC2014), with a minimum average mark of 75; and

(iii) a minimum of 30 credit points of senior Psychology units of study (which must include PSYC3010 and (PSYC3018, if PSYC2010 / PSYC2910 not previously completed) with a minimum average mark of 75; and

(b) 48 credit points of Psychology Honours units of study from the Honours units of study table.

(4) *Science Stream*

(a) The only units of study which may be taken by students in the Science stream of the degree are set out in Table 1 from the Faculty of Science and Table A and Table B from the Faculty of Arts and Social Sciences.

(b) Students in the Science stream must complete a minimum of 96 credit points from Science subject areas in Table 1 before progression to Honours; including:

(i) a minimum of 12 credit points from the Science subject areas of Mathematics and Statistics; and

(ii) a minimum of 12 credit points of Junior units of study from Science subject areas other than Psychology and Mathematics and Statistics; or

(5) *Arts and Social Sciences Stream*

(a) The only units of study which may be taken by students in the Arts and Social Sciences stream of the degree are set out in Table A from the Faculty of Arts and Social Sciences and Table 1 from the Faculty of Science. Units of study cannot be taken from Table B from the Faculty of Arts and Social Sciences.

(b) Students in the Arts and Social Sciences stream must:

(I) complete a major in an Arts and Social Science subject area from Table A as set out in the course resolution for Bachelor of Arts degree before progression to Honours; and

(II) ensure a minimum of 60 credit points of units of study from Table A.

5 Progression rules

(1) Students must achieve a minimum average mark of 65 in junior Psychology units of study and a minimum average mark of 75 in both intermediate and senior Psychology units of study in order to progress to the final Honours year.

(2) Students who fail to maintain the required average in Psychology units of study specified above will be transferred to either the Bachelor of Science or the Bachelor of Arts in their next year of enrolment with full credit for the units of study completed.

(3) Students who complete all course requirements to the end of the third year, but fail to achieve the required average in Psychology units in order to progress to the Honours year will be awarded the Bachelor of Science or Bachelor of Arts.

(4) Completion of the Honours year in Psychology is a requirement for the award of the Bachelor of Psychology.

(5) To qualify for admission to the Honours year a candidate must have completed 144 credit points including the remaining common requirements and the relevant units from Arts and Social Sciences or Science.

(6) To qualify for the award of the Bachelor of Psychology a candidate must complete 48 credit points of units of study from the Honours units of study table, with an honours mark of at least 65.

6 Award of the degree

(1) The Bachelor of Psychology is an integrated Honours program. In accordance with the Coursework Policy, the award of Honours is assessed and calculated using a grade average based on 48 credit points of Psychology Honours units of study undertaken in the candidate’s final year of study. Psychology Honours units of study are set out in the Faculty of Science Honours units of study table.

(2) The Bachelor of Psychology is awarded in classes ranging from First Class to Third Class according to the conditions specified in the Coursework Policy and the Resolutions of the Faculty of Science.

(3) Candidates who do not achieve an Honours mark of 65 or more will be awarded a Bachelor of Science or Bachelor of Arts, depending on their chosen stream.

7 Transitional provisions

(1) These resolutions apply to persons who commenced their candidature after 1 January, 2017 and persons who commenced their candidature prior to 1 January, 2017 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2017 may complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that requirements are completed by 1 January, 2022, or later date as the Faculty may, in special circumstances, approve.

(3) Students who commenced their degree prior to 1 January 2018 or who progress according to degree resolutions applicable to students commencing before that date may take major/s from the major/s listed under 'Transitional Provisions' in Table 1.

Bachelor of Science

Bachelor of Science

Bachelor of Science/Bachelor of Advanced Studies

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BPSCIENC-05	Bachelor of Science
BPSCIAVS-01	Bachelor of Science / Bachelor of Advanced Studies

2 Attendance pattern

The attendance pattern for this course is full time or part time according to candidate choice.

3 Streams

(1) Candidates may enter and complete the Bachelor of Science or the Bachelor of Science/Bachelor of Advanced Studies through a stream.
(2) The Bachelor of Science is available in the following streams:
(a) Health
(b) Medical Science
(c) Dalyell
(3) Completion of a stream is not a requirement of the Bachelor of Science. The requirements for the completion of each stream are as specified in Table A for the Bachelor of Science or, in the case of the Dalyell stream, in Table S of the Shared Pool for Undergraduate Degrees.
(4) The Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies are available in the following streams:
(a) Advanced
(b) Agriculture
(c) Animal and Veterinary Science
(d) Food and Agribusiness
(e) Health
(f) Medical Science
(g) Dalyell
(5) Completion of a stream is not a requirement of the Bachelor of Science/Bachelor of Advanced Studies. The requirements for the completion of each stream are as specified in Table A for the Bachelor of Science or, in the case of the Dalyell stream, in Table S of the Shared Pool for Undergraduate Degrees.
(6) Candidates wishing to transfer between streams should contact the Student Centre.
(7) Candidates who qualify for the Dalyell stream may complete that stream while also completing another stream.

4 Cross-faculty management

(1) Candidates in Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies will be under the supervision of the Faculty of Science throughout.
(2) Candidates undertaking honours will be under the management of the Faculty of Science. Admission, requirements, award of the honours mark, and award of the grade of honours for an honours component undertaken by a candidate will be under the academic governance of the faculty offering and supervising the embedded honours component. The faculty offering and supervising the embedded component will direct the Faculty of Science on all matters relating to admission, requirements, award of honours mark and award of honours grade.
(3) The Dean of the Faculty of Science shall exercise authority in any matter concerned with the Bachelor of Science/Bachelor of Advanced Studies and the Bachelor of Science/Bachelor Advanced Studies with honours not otherwise dealt with in these resolutions.

5 Admission to candidature

(1) Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents), tertiary study or an approved preparation program. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for mature aged applicants who do not possess a school leaving qualification, educationally disadvantaged applicants and for Aboriginal and Torres Strait Islander applicants. Applicants are ranked by merit and offers for available places are issued according to the ranking. Details of admission policies are found in the Coursework Rule and the Coursework Policy.
(2) Admission to the Dalyell stream requires achievement of a minimum tertiary admission rank (ATAR) set by the Board of Interdisciplinary Studies, or equivalent.

6 Requirements for award

(1) The units of study that may be taken for the Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies are set out in:
(a) Table A for the Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies;
(b) Table S of the Shared Pool for Undergraduate Degrees; and
(c) Table O of the Shared Pool for Undergraduate Degrees. In these resolutions, except where otherwise specified, Table A, Table S and Table O mean Table A, Table S and Table O as specified here.

(2) *Bachelor of Science:*
To qualify for the award of the Bachelor of Science, a candidate must complete 144 credit points, comprising:
(a) Degree Core: 12 credit points of mathematics degree core units of study as set out in Table A (students may count the units from their major(s) or minor(s) to fulfil this requirement); and 12 credit points of 1000-level science elective units of study (excluding units listed as Mathematics degree core) as set out in Table A (students may count the units from their major(s) or minor(s) to fulfil this requirement); and
(b) a major (48 credit points) or program listed and defined in Section 7 below and specified in Table A; and
(c) a minor (36 credit points) or second major (48 credit points) as defined in Section 7 below and listed and specified in Table A or Table S; and
(d) a minimum of 12 credit points of units of study in the Open Learning Environment as listed in Table O and
(e) where appropriate, elective units from Table A and Table S; and
(f) if enrolled in a stream, complete the requirements for the stream as specified in Table A.
(3) *Bachelor of Science/Bachelor of Advanced Studies:*
(a) Degree Core: 12 credit points of mathematics degree core units of study as set out in Table A (students may count the units from their major(s) or minor(s) to fulfil this requirement); and 12 credit points of 1000-level science elective units of study (excluding units listed as Mathematics degree core) as set out in Table A (students may count the units from their major(s) or minor(s) to fulfil this requirement); and
(b) a major (48 credit points) or program listed and defined in Section 7 below and specified in Table A; and
(c) a second major (48 credit points) as defined in Section 7 below and specified in Table A or Table S; and
(d) a minimum of 12 credit points of units of study in the Open Learning Environment as listed in Table O; and
(e) a minimum of 24 credit points at 4000 level from Table A or Table S, including a research, community, industry or entrepreneurship project of at least 12 and a maximum of 36 credit points; and
(f) where appropriate, elective units from Table A or Table S; and
(g) if enrolled in a stream, complete the requirements for the stream as specified in Table A.

7 Programs, majors and minors

(1) *Bachelor of Science:*
(a) Completion of a major or program from Table A and a minor or second major from Table A or Table S is a requirement of the Bachelor of Science. Requirements for completion of majors and minors are as set out in Table A and Table S.
(b) Candidates in the Bachelor of Science have the option of completing:
(i) a program (which contains a major); and
(ii) a second major from Table A or Table S in place of the minor.
(2) *Bachelor of Science/Bachelor of Advanced Studies:*
Completion of a major or a program (which contains a major) from Table A and second major from Table A or Table S is a requirement of the Bachelor of Science/Bachelor of Advanced Studies. Requirements for completion of majors and minors are as set out in Table A and Table S.
(3) The majors and minors available in Table A in the Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies are:

Majors	Minors
Anatomy and Histology	Anatomy and Histology
Animal Health, Disease and Welfare	Animal Health, Disease and Welfare
Animal Production	Animal Production
Animal Veterinary Bioscience (only available in Animal Veterinary Bioscience program)	
Applied Medical Science	Applied Medical Science
Behavioural Sciences	Behavioural Sciences
Biochemistry and Molecular Biology	Biochemistry and Molecular Biology
Biology	Biology Plant Science
Cell and Developmental Biology	Cell and Developmental Biology
Chemistry	Chemistry
Computer Science	Computer Science
Data Science	Data Science
Ecology and Evolutionary Biology	Wildlife Conservation
Environmental Studies	Environmental Studies
Environmental Science (only available in Environmental Science program)	
Financial Mathematics and Statistics	Financial Mathematics and Statistics
Food Science	Food Science
Genetics and Genomics	Genetics and Genomics
Geography	Geography
Geology and Geophysics	Geology and Geophysics
Health (only available in Health stream)	
History and Philosophy of Science	History and Philosophy of Science
Human Movement (only available in Health stream)	Human Movement (only available in Health stream) Immunology
Immunology and Pathology	Pathology
Infectious Diseases	Infectious Diseases
Information Systems	Information Systems
Marine Science	Marine Science
Mathematics	Mathematics
Medical Science (only available in Medical Science program)	
Medicinal Chemistry	Medicinal Chemistry
Microbiology	Microbiology

Majors	Minors
Neuroscience	Neuroscience
Nutrition Science	Nutrition Science
Pharmacology	Pharmacology
Physics	Physics
Physiology	Physiology
Plant Production	Plant Production
Quantitative Life Sciences	Quantitative Life Sciences
Software Development	Software Development
Soil Science and Hydrology	Soil Science and Hydrology
Statistics	Statistics

(4) The programs available in Table A of the Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies are:

The programs available in the Bachelor of Science are:	The programs available in the Bachelor of Science/Bachelor of Advanced Studies are:
Agroecosystems	Agriculture (only available in Agriculture stream)
Medical Science (only available in Medical Science stream)	Agroecosystems
Environmental Science	Food and Agribusiness (only available in Food and Agribusiness stream)
Neuroscience	Animal Veterinary Bioscience (only available in Animal Veterinary Bioscience stream
Psychology	Medical Science (only available in Medical Science stream)
Mathematical Sciences (only available in Dalyell stream)	Environmental Science
	Nanoscience and Nanotechnology
	Neuroscience
	Psychology
	Mathematical Sciences (only available in Dalyell stream)

(5) The minors and majors available as second majors in the Bachelor of Science are as listed in Table A and Table S.

8 Progression rules

(1) *Progression within a stream, program or Honours component:*
Enrolment and progression for each candidate for a stream, program or honours component is governed by progression rules specified in the relevant Table for the component.

(2) *Progression within Bachelor of Science/Bachelor of Advanced Studies:*
Except with the permission of the Dean, candidates who are not in the Dalyell stream must complete the degree requirements listed under Section 6(1) before progressing to 4000-level units (including 4000-level project units).

(3) *Progression within the Dalyell Stream:*
(a) With the permission of the Dalyell coordinator, candidates in the Dalyell Stream may attempt units at higher levels than the usual sequence.
(b) Candidates must achieve an Annual Average Mark at a level determined by the Board of Interdisciplinary Studies in each year of study or over for each 48 credit-point block to continue in the Dalyell Stream. Candidates who do not maintain an Annual Average Mark at the level determined by the Board of Interdisciplinary Studies may continue in any other stream into which they were admitted, major, program or minor but will not remain in the Dalyell Stream.

(4) *Progression within the Advanced Stream:*
(a) Candidates in the Advanced Stream may attempt advanced or units at higher levels than the usual sequence.
(b) Candidates must achieve an Annual Average Mark of at least 65.0 for each 48 credit-point block to continue in the Advanced Stream. Candidates who do not maintain an Annual Average Mark at this level may continue in the Bachelor of Science, major, program or minor but will not remain in the Advanced Stream.

9 Requirements for the Bachelor of Science/Bachelor of Advanced Studies with honours

(1) An embedded honours component, involving a research project, is available to meritorious students in the Bachelor of Science/Bachelor of Advanced Studies who complete an alternative set of units of study in the final year. Candidates undertaking an honours component within the Faculty of Science must complete the requirements for the honours component full-time over two consecutive semesters. If the School is satisfied that a student is unable to attempt the honours component on a full time basis and if the Associate Dean so recommends, permission may be granted to undertake honours part-time over four consecutive semesters. For candidates undertaking an honours component with the Faculty of Science, admission, requirements and award of honours are according to the Coursework Policy, these resolutions and the Resolutions of the Faculty of Science. For candidates undertaking an honours component in another faculty, admission, requirements and award of honours are according to the Coursework Policy, these resolutions and the relevant resolutions of the faculty in which the component is undertaken.

(2) Admission to the honours program is by permission of the Associate Dean and relevant honours coordinator or head of department after the completion of all of the following requirements:
(a) a Bachelor of Science degree (or equivalent) including at least one major or program; or 144 credit points, including at least one major or program, any degree or stream-specific core, and a minor, or equivalent studies at another institution.
(b) an AAM of at least 65.0 in units of study completed to that point, and a major or study of equivalent depth in the area of the proposed honours project; or a credit average in 48 credit points in relevant intermediate and senior Science units of study relevant to the honours area, as determined by the School concerned;
(c) any requirements for honours entry set by the relevant department, school or faculty.

(3) To qualify for the award of the Bachelor of Science/Bachelor of Advanced Studies with honours, a candidate must complete the requirements for the pass degree and at least 36 and a maximum of 48 credit points of additional honours units at 4000 level or above, including an honours research project of at least 12 and a maximum of 36 credit points, and at least 12 and a maximum of 36 credit points of honours coursework, as required by the relevant department and published in the faculty handbook. Honours subject areas and units of study for honours within the Faculty of Science are listed in Table A for the relevant faculty or Table S in the Shared Pool for Undergraduate degrees.

(4) The grade of honours will be determined by an honours mark calculated from work, including the embedded honours component as specified in these resolutions, in the resolutions for the Faculty of Science or in the resolutions of the relevant faculty.

10 Award of the Bachelor of Science, Bachelor of Science/Bachelor of Advanced Studies and Bachelor of Science/Bachelor of Advanced Studies with Honours

(1) Candidates for the Bachelor of Science/Bachelor of Advanced Studies combined degree who have completed requirements for the Bachelor of Science who do not meet requirements for the combined degree will be awarded the Bachelor of Science.

(2) Honours in the Bachelor of Science/Bachelor of Advanced Studies is awarded in classes ranging from First Class to Third Class according to the following table and rules specified in the Resolutions of the Faculty of Science or relevant resolutions for the faculty in which the embedded honours component is undertaken.

A student who achieves an honours mark in the range …	will be awarded honours …
80 honours mark 100	First Class
75 honours mark < 80	Second Class / Division 1
70 honours mark < 75	Second Class / Division 2
65 honours mark < 70	Third Class

(3) Candidates for the award of the Bachelor of Science/Bachelor of Advanced Studies with honours who do not meet the requirements for the honours degree, but who otherwise meet requirements for the Bachelor of Science, or the Bachelor of Science/Bachelor of Advanced Studies will be awarded the Bachelor of Science or Bachelor of Science/Bachelor of Advanced Studies as appropriate.

11 Cross-institutional study

Cross-institutional study is available in this course under conditions specified in the Resolutions of the Faculty of Science.

12 International exchange

The Faculty of Science encourages candidates in this course to participate in international exchange programs as set out in the Resolutions of the Faculty of Science.

13 Course transfer

A candidate may transfer from the Bachelor of Science and elect to complete the Bachelor of Science/Bachelor of Advanced Studies in accordance with these resolutions and receive full credit for work completed in the Bachelor of Science. A candidate may abandon the Bachelor of Science/Bachelor of Advanced Studies combined degree and elect to complete the Bachelor of Science in accordance with these resolutions and receive credit in accordance with the requirements of the Bachelor of Science. Readmission to the Bachelor of Science/Bachelor of Advanced Studies in the future will require a new application for admission to candidature for that course and completion in accordance with the resolutions governing that degree.

14 Credit for previous study

Credit transfer is subject to the provisions of the Coursework Policy and the Resolutions of the Faculty of Science or, in the case of a major or minor offered by another faculty, any relevant resolutions of that faculty.

15 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2018 and students who commenced their candidature prior to 1 January, 2018 who elect to proceed under these resolutions. Students who commenced their candidature prior to 1 January 2018 who elect to transfer and proceed under these resolutions should note that the University does not undertake to offer 4000 level units and projects in the Bachelor of Science/Bachelor of Advanced Studies combined degree prior to 2020 and 2000 and 3000 level units of study prior to 2019 and that it may not be possible to complete requirements for the combined degree before the end of Semester 2 2020 or the single degree before the end of Semester 2 2019.

(2) Candidates who commence candidature after 1 January, 2018 who are seeking credit for prior study should note that the University does not undertake to offer 4000 level units and projects in the Bachelor of Science/Bachelor of Advanced Studies combined degree prior to 2020 and 2000 and 3000 level units of study prior to 2019 and that it may not be possible to complete requirements for the combined degree before the end of Semester 2 2020 or the single degree before the end of Semester 2 2019. Where a student in the Bachelor of Science proceeding under these resolutions applies for and is granted credit and wishes to complete the degree before 1 January 2020, the student will be offered the opportunity to complete the Bachelor of Science degree under the resolutions that applied at 1 January 2017.

(3) Candidates who commenced prior to 1 January, 2018 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Bachelor of Science / Bachelor of Advanced Studies

Bachelor of Science

Bachelor of Science/Bachelor of Advanced Studies

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BPSCIENC-05	Bachelor of Science
BPSCIAVS-01	Bachelor of Science / Bachelor of Advanced Studies

2 Attendance pattern

The attendance pattern for this course is full time or part time according to candidate choice.

3 Streams

(1) Candidates may enter and complete the Bachelor of Science or the Bachelor of Science/Bachelor of Advanced Studies through a stream.
(2) The Bachelor of Science is available in the following streams:
(a) Health
(b) Medical Science
(c) Dalyell
(3) Completion of a stream is not a requirement of the Bachelor of Science. The requirements for the completion of each stream are as specified in Table A for the Bachelor of Science or, in the case of the Dalyell stream, in Table S of the Shared Pool for Undergraduate Degrees.
(4) The Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies are available in the following streams:
(a) Advanced
(b) Agriculture
(c) Animal and Veterinary Science
(d) Food and Agribusiness
(e) Health
(f) Medical Science
(g) Dalyell
(5) Completion of a stream is not a requirement of the Bachelor of Science/Bachelor of Advanced Studies. The requirements for the completion of each stream are as specified in Table A for the Bachelor of Science or, in the case of the Dalyell stream, in Table S of the Shared Pool for Undergraduate Degrees.
(6) Candidates wishing to transfer between streams should contact the Student Centre.
(7) Candidates who qualify for the Dalyell stream may complete that stream while also completing another stream.

4 Cross-faculty management

(1) Candidates in Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies will be under the supervision of the Faculty of Science throughout.
(2) Candidates undertaking honours will be under the management of the Faculty of Science. Admission, requirements, award of the honours mark, and award of the grade of honours for an honours component undertaken by a candidate will be under the academic governance of the faculty offering and supervising the embedded honours component. The faculty offering and supervising the embedded component will direct the Faculty of Science on all matters relating to admission, requirements, award of honours mark and award of honours grade.
(3) The Dean of the Faculty of Science shall exercise authority in any matter concerned with the Bachelor of Science/Bachelor of Advanced Studies and the Bachelor of Science/Bachelor Advanced Studies with honours not otherwise dealt with in these resolutions.

5 Admission to candidature

(1) Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents), tertiary study or an approved preparation program. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for mature aged applicants who do not possess a school leaving qualification, educationally disadvantaged applicants and for Aboriginal and Torres Strait Islander applicants. Applicants are ranked by merit and offers for available places are issued according to the ranking. Details of admission policies are found in the Coursework Rule and the Coursework Policy.
(2) Admission to the Dalyell stream requires achievement of a minimum tertiary admission rank (ATAR) set by the Board of Interdisciplinary Studies, or equivalent.

6 Requirements for award

(1) The units of study that may be taken for the Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies are set out in:
(a) Table A for the Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies;
(b) Table S of the Shared Pool for Undergraduate Degrees; and
(c) Table O of the Shared Pool for Undergraduate Degrees. In these resolutions, except where otherwise specified, Table A, Table S and Table O mean Table A, Table S and Table O as specified here.

(2) *Bachelor of Science:*

To qualify for the award of the Bachelor of Science, a candidate must complete 144 credit points, comprising:

(a) Degree Core: 12 credit points of mathematics degree core units of study as set out in Table A (students may count the units from their major(s) or minor(s) to fulfil this requirement); and 12 credit points of 1000-level science elective units of study (excluding units listed as Mathematics degree core) as set out in Table A (students may count the units from their major(s) or minor(s) to fulfil this requirement); and

(b) a major (48 credit points) or program listed and defined in Section 7 below and specified in Table A; and

(c) a minor (36 credit points) or second major (48 credit points) as defined in Section 7 below and listed and specified in Table A or Table S; and

(d) a minimum of 12 credit points of units of study in the Open Learning Environment as listed in Table O and

(e) where appropriate, elective units from Table A and Table S; and

(f) if enrolled in a stream, complete the requirements for the stream as specified in Table A.

(3) *Bachelor of Science/Bachelor of Advanced Studies:*

(a) Degree Core: 12 credit points of mathematics degree core units of study as set out in Table A (students may count the units from their major(s) or minor(s) to fulfil this requirement); and 12 credit points of 1000-level science elective units of study (excluding units listed as Mathematics degree core) as set out in Table A (students may count the units from their major(s) or minor(s) to fulfil this requirement); and

(b) a major (48 credit points) or program listed and defined in Section 7 below and specified in Table A; and

(c) a second major (48 credit points) as defined in Section 7 below and specified in Table A or Table S; and

(d) a minimum of 12 credit points of units of study in the Open Learning Environment as listed in Table O; and

(e) a minimum of 24 credit points at 4000 level from Table A or Table S, including a research, community, industry or entrepreneurship project of at least 12 and a maximum of 36 credit points; and

(f) where appropriate, elective units from Table A or Table S; and

(g) if enrolled in a stream, complete the requirements for the stream as specified in Table A.

7 Programs, majors and minors

(1) *Bachelor of Science:*

(a) Completion of a major or program from Table A and a minor or second major from Table A or Table S is a requirement of the Bachelor of Science. Requirements for completion of majors and minors are as set out in Table A and Table S.

(b) Candidates in the Bachelor of Science have the option of completing:

(i) a program (which contains a major); and

(ii) a second major from Table A or Table S in place of the minor.

(2) *Bachelor of Science/Bachelor of Advanced Studies:*

Completion of a major or a program (which contains a major) from Table A and second major from Table A or Table S is a requirement of the Bachelor of Science/Bachelor of Advanced Studies. Requirements for completion of majors and minors are as set out in Table A and Table S.

(3) The majors and minors available in Table A in the Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies are:

Majors	**Minors**
Anatomy and Histology	Anatomy and Histology
Animal Health, Disease and Welfare	Animal Health, Disease and Welfare
Animal Production	Animal Production
Animal Veterinary Bioscience (only available in Animal Veterinary Bioscience program)	
Applied Medical Science	Applied Medical Science
Behavioural Sciences	Behavioural Sciences
Biochemistry and Molecular Biology	Biochemistry and Molecular Biology
Biology	Biology Plant Science
Cell and Developmental Biology	Cell and Developmental Biology
Chemistry	Chemistry
Computer Science	Computer Science
Data Science	Data Science
Ecology and Evolutionary Biology	Wildlife Conservation
Environmental Studies	Environmental Studies
Environmental Science (only available in Environmental Science program)	
Financial Mathematics and Statistics	Financial Mathematics and Statistics
Food Science	Food Science
Genetics and Genomics	Genetics and Genomics
Geography	Geography
Geology and Geophysics	Geology and Geophysics
Health (only available in Health stream)	
History and Philosophy of Science	History and Philosophy of Science
Human Movement (only available in Health stream)	Human Movement (only available in Health stream) Immunology
Immunology and Pathology	Pathology
Infectious Diseases	Infectious Diseases
Information Systems	Information Systems
Marine Science	Marine Science
Mathematics	Mathematics
Medical Science (only available in Medical Science program)	
Medicinal Chemistry	Medicinal Chemistry
Microbiology	Microbiology

Majors	Minors
Neuroscience	Neuroscience
Nutrition Science	Nutrition Science
Pharmacology	Pharmacology
Physics	Physics
Physiology	Physiology
Plant Production	Plant Production
Quantitative Life Sciences	Quantitative Life Sciences
Software Development	Software Development
Soil Science and Hydrology	Soil Science and Hydrology
Statistics	Statistics

(4) The programs available in Table A of the Bachelor of Science and the Bachelor of Science/Bachelor of Advanced Studies are:

The programs available in the Bachelor of Science are:	The programs available in the Bachelor of Science/Bachelor of Advanced Studies are:
Agroecosystems	Agriculture (only available in Agriculture stream)
Medical Science (only available in Medical Science stream)	Agroecosystems
Environmental Science	Food and Agribusiness (only available in Food and Agribusiness stream)
Neuroscience	Animal Veterinary Bioscience (only available in Animal Veterinary Bioscience stream
Psychology	Medical Science (only available in Medical Science stream)
Mathematical Sciences (only available in Dalyell stream)	Environmental Science
	Nanoscience and Nanotechnology
	Neuroscience
	Psychology
	Mathematical Sciences (only available in Dalyell stream)

(5) The minors and majors available as second majors in the Bachelor of Science are as listed in Table A and Table S.

8 Progression rules

(1) *Progression within a stream, program or Honours component:*
Enrolment and progression for each candidate for a stream, program or honours component is governed by progression rules specified in the relevant Table for the component.

(2) *Progression within Bachelor of Science/Bachelor of Advanced Studies:*
Except with the permission of the Dean, candidates who are not in the Dalyell stream must complete the degree requirements listed under Section 6(1) before progressing to 4000-level units (including 4000-level project units).

(3) *Progression within the Dalyell Stream:*

(a) With the permission of the Dalyell coordinator, candidates in the Dalyell Stream may attempt units at higher levels than the usual sequence.

(b) Candidates must achieve an Annual Average Mark at a level determined by the Board of Interdisciplinary Studies in each year of study or over for each 48 credit-point block to continue in the Dalyell Stream. Candidates who do not maintain an Annual Average Mark at the level determined by the Board of Interdisciplinary Studies may continue in any other stream into which they were admitted, major, program or minor but will not remain in the Dalyell Stream.

(4) *Progression within the Advanced Stream:*

(a) Candidates in the Advanced Stream may attempt advanced or units at higher levels than the usual sequence.

(b) Candidates must achieve an Annual Average Mark of at least 65.0 for each 48 credit-point block to continue in the Advanced Stream. Candidates who do not maintain an Annual Average Mark at this level may continue in the Bachelor of Science, major, program or minor but will not remain in the Advanced Stream.

9 Requirements for the Bachelor of Science/Bachelor of Advanced Studies with honours

(1) An embedded honours component, involving a research project, is available to meritorious students in the Bachelor of Science/Bachelor of Advanced Studies who complete an alternative set of units of study in the final year. Candidates undertaking an honours component within the Faculty of Science must complete the requirements for the honours component full-time over two consecutive semesters. If the School is satisfied that a student is unable to attempt the honours component on a full time basis and if the Associate Dean so recommends, permission may be granted to undertake honours part-time over four consecutive semesters. For candidates undertaking an honours component with the Faculty of Science, admission, requirements and award of honours are according to the Coursework Policy, these resolutions and the Resolutions of the Faculty of Science. For candidates undertaking an honours component in another faculty, admission, requirements and award of honours are according to the Coursework Policy, these resolutions and the relevant resolutions of the faculty in which the component is undertaken.

(2) Admission to the honours program is by permission of the Associate Dean and relevant honours coordinator or head of department after the completion of all of the following requirements:

(a) a Bachelor of Science degree (or equivalent) including at least one major or program; or 144 credit points, including at least one major or program, any degree or stream-specific core, and a minor, or equivalent studies at another institution.

(b) an AAM of at least 65.0 in units of study completed to that point, and a major or study of equivalent depth in the area of the proposed honours project; or a credit average in 48 credit points in relevant intermediate and senior Science units of study relevant to the honours area, as determined by the School concerned;

(c) any requirements for honours entry set by the relevant department, school or faculty.

(3) To qualify for the award of the Bachelor of Science/Bachelor of Advanced Studies with honours, a candidate must complete the requirements for the pass degree and at least 36 and a maximum of 48 credit points of additional honours units at 4000 level or above, including an honours research project of at least 12 and a maximum of 36 credit points, and at least 12 and a maximum of 36 credit points of honours coursework, as required by the relevant department and published in the faculty handbook. Honours subject areas and units of study for honours within the Faculty of Science are listed in Table A for the relevant faculty or Table S in the Shared Pool for Undergraduate degrees.

(4) The grade of honours will be determined by an honours mark calculated from work, including the embedded honours component as specified in these resolutions, in the resolutions for the Faculty of Science or in the resolutions of the relevant faculty.

10 Award of the Bachelor of Science, Bachelor of Science/Bachelor of Advanced Studies and Bachelor of Science/Bachelor of Advanced Studies with Honours

(1) Candidates for the Bachelor of Science/Bachelor of Advanced Studies combined degree who have completed requirements for the Bachelor of Science who do not meet requirements for the combined degree will be awarded the Bachelor of Science.

(2) Honours in the Bachelor of Science/Bachelor of Advanced Studies is awarded in classes ranging from First Class to Third Class according to the following table and rules specified in the Resolutions of the Faculty of Science or relevant resolutions for the faculty in which the embedded honours component is undertaken.

A student who achieves an honours mark in the range …	**will be awarded honours …**
80 honours mark 100	First Class
75 honours mark < 80	Second Class / Division 1
70 honours mark < 75	Second Class / Division 2
65 honours mark < 70	Third Class

(3) Candidates for the award of the Bachelor of Science/Bachelor of Advanced Studies with honours who do not meet the requirements for the honours degree, but who otherwise meet requirements for the Bachelor of Science, or the Bachelor of Science/Bachelor of Advanced Studies will be awarded the Bachelor of Science or Bachelor of Science/Bachelor of Advanced Studies as appropriate.

11 Cross-institutional study

Cross-institutional study is available in this course under conditions specified in the Resolutions of the Faculty of Science.

12 International exchange

The Faculty of Science encourages candidates in this course to participate in international exchange programs as set out in the Resolutions of the Faculty of Science.

13 Course transfer

A candidate may transfer from the Bachelor of Science and elect to complete the Bachelor of Science/Bachelor of Advanced Studies in accordance with these resolutions and receive full credit for work completed in the Bachelor of Science. A candidate may abandon the Bachelor of Science/Bachelor of Advanced Studies combined degree and elect to complete the Bachelor of Science in accordance with these resolutions and receive credit in accordance with the requirements of the Bachelor of Science. Readmission to the Bachelor of Science/Bachelor of Advanced Studies in the future will require a new application for admission to candidature for that course and completion in accordance with the resolutions governing that degree.

14 Credit for previous study

Credit transfer is subject to the provisions of the Coursework Policy and the Resolutions of the Faculty of Science or, in the case of a major or minor offered by another faculty, any relevant resolutions of that faculty.

15 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2018 and students who commenced their candidature prior to 1 January, 2018 who elect to proceed under these resolutions. Students who commenced their candidature prior to 1 January 2018 who elect to transfer and proceed under these resolutions should note that the University does not undertake to offer 4000 level units and projects in the Bachelor of Science/Bachelor of Advanced Studies combined degree prior to 2020 and 2000 and 3000 level units of study prior to 2019 and that it may not be possible to complete requirements for the combined degree before the end of Semester 2 2020 or the single degree before the end of Semester 2 2019.

(2) Candidates who commence candidature after 1 January, 2018 who are seeking credit for prior study should note that the University does not undertake to offer 4000 level units and projects in the Bachelor of Science/Bachelor of Advanced Studies combined degree prior to 2020 and 2000 and 3000 level units of study prior to 2019 and that it may not be possible to complete requirements for the combined degree before the end of Semester 2 2020 or the single degree before the end of Semester 2 2019. Where a student in the Bachelor of Science proceeding under these resolutions applies for and is granted credit and wishes to complete the degree before 1 January 2020, the student will be offered the opportunity to complete the Bachelor of Science degree under the resolutions that applied at 1 January 2017.

(3) Candidates who commenced prior to 1 January, 2018 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Bachelor of Science / Bachelor of Laws

Bachelor of Science and Bachelor of Laws

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty of Science and of the University of Sydney Law School, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BPSCILAW-02	Bachelor of Science and Bachelor of Laws

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) The Bachelor of Science in this combined degree is available in the following streams:
(a) Dalyell.
(2) Completion of a stream is not a requirement of the Bachelor of Science. The requirements for the completion of each stream are as specified in Table A for the Bachelor of Science or, in the case of the Dalyell Stream, in Table S of the Shared Pool for Undergraduate Degrees.
(3) Candidates wishing to transfer between streams should contact the Student Centre.
(4) Candidates who qualify for the Dalyell Stream may complete that stream while also completing another stream.

4 Cross faculty management

(1) Candidates will be under the general supervision of the Faculty of Science until the end of the semester in which they complete requirements for the Bachelor of Science. After completion of requirements for the Bachelor of Science, students will be under the supervision of the University of Sydney Law School.
(2) The Dean of the Faculty of Science and the Head of School and Dean of the Sydney Law School shall jointly exercise authority in any matter concerned with the combined course not otherwise dealt with in these resolutions.

5 Admission to candidature

(1) Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents), tertiary study or an approved preparation program. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for educationally disadvantaged applicants and for Aboriginal and Torres Strait Islander people. Applicants are ranked by merit and offers for available places are issued according to the ranking. Details of admission requirements are found in the Coursework Rule and the Coursework Policy.
(2) Admission to the Dalyell Stream requires achievement of a minimum tertiary admission rank (ATAR) set by the Board of Interdisciplinary Studies or above in or equivalent standard.

6 Requirements for award

(1) The units of study that may be taken for this combined degree are set out in:
(a) Table A for the Bachelor of Science;
(b) the University of Sydney Law School Undergraduate Table;
(c) Table S from the Shared Pool for Undergraduate Degrees; and
(d) Table O of the Shared Pool for Undergraduate Degrees.
(e) In these resolutions, except where otherwise specified, Table A, the University of Sydney Law School Undergraduate Table, Table S and Table O mean Table A, the University of Sydney Law School Undergraduate Table, Table S and Table O as specified here.
(2) To qualify for the award of the pass combined degrees, a candidate must complete 240 credit points, comprising:
(a) a major (48 credit points) from Table A for the Bachelor of Science as set out in Section 7 below;
(b) 12 credit points of mathematics degree core units of study as set out in Table A (students may count the units from their major to fulfil this requirement); and
(c) 12 credit points of junior science elective units of study (excluding Mathematics) as set out in Table A (students may count the units from their major to fulfil this requirement); and
(d) 12 credit points of units from the Open Learning Environment as set out in Table O in the Shared Pool for Undergraduate Degrees;
(e) a minimum of 24 credit points of elective units or units taken towards a program from Table A for the Bachelor of Science or Table S in the Shared Pool for Undergraduate Degrees;
(f) if enrolled in a stream, complete the requirements for the stream as specified in Table A; and
(g) 144 credit points of Law units of study as specified in the University of Sydney Law School Undergraduate Table, of which 48 credit points are Combined Law compulsory units of study for Years 1, 2 and 3 of the combined degree and are credited towards the requirements for both the Bachelor of Science and the Bachelor of Laws.
(3) Requirements for the Bachelor of Science
To qualify for the award of the Bachelor of Science, a candidate must complete 144 credit points, comprising:
(a) 96 credit points specified in 6 (2) (a) – (f) above; and
(b) 48 credit points of Combined Law compulsory subjects from years 1, 2 and 3 from the University of Sydney Law School Undergraduate Table which shall take the place of the minor specified in the course resolutions for the Bachelor of Science.
(4) Requirements in the Bachelor of Science and Bachelor of Laws who also enrol in the Bachelor of Advanced Studies

For candidates completing the Bachelor of Science in a combined degree with the Bachelor of Laws who enrol in the Bachelor of Advanced Studies to complete a stream or honours, the requirement in the Bachelor of Advanced Studies for completion of a second major shall be met by the 48 credit points of Law units specified in 6 (3) (b) above.

(5) Requirements for the Bachelor of Laws

To qualify for the award of the Bachelor of Laws, a candidate must complete 144 credit points taken from the Sydney Law School Undergraduate Table, comprising:

(a) 102 credit points of compulsory units of study as specified in the University of Sydney Law School Undergraduate Table;
(b) 42 credit points from the Elective Unit of Study Table (undergraduate) for the University of Sydney Law School, of which a maximum of 36 credit points are taken from Part 1, Elective Units of Study, or as specified in 6 (5) (c) below, and a minimum of 6 credit points are taken from Part 2, Jurisprudence Units of Study; and
(c) Students may apply to take up to a maximum of 24 credit points of advanced learning Master's units of study as elective units of study.
(i) Enrolment in Master's units of study will be subject to availability and any unit pre-requisites or assumed knowledge, which may include relevant industry experience or prior specialist study.
(ii) Enrolment in Master’s units is only permitted after a candidate has completed 96 credit points towards the Bachelor of Laws.
(iii) Students may only enrol in Master’s units listed in the Bachelor of Laws Elective units of study Table.

7 Majors and Programs

(1) Completion of a major from Table A for the Bachelor of Science is a requirement for this combined degree.
(2) Candidates have the option of completing a program with an embedded major from Table A for the Bachelor of Science of up to 72 credit points.
(3) The majors and programs for the Bachelor of Science are as specified in the Learning and Teaching Policy and in the degree resolutions and Table A for the Bachelor of Science.

8 Progression rules

(1) Candidates in a combined law program must successfully complete LAWS1006 Foundations of Law before enrolling in any other Bachelor of Laws units of study.
(2) Candidates are required to complete Bachelor of Laws units in the order listed in the Sydney Law School Undergraduate Table.
(3) Except with permission of the Head of School and Dean of the Sydney Law School, candidates must complete the requirements for the Bachelor of Science before proceeding to Year Four of the combined degree with the Bachelor of Laws.
(5) Progression with the Dalyell Stream

Candidates in the Dalyell Stream may proceed in the Bachelor of Science according to the resolutions of the Bachelor of Science, Bachelor of Science/Bachelor of Advanced Studies and Table S.

9 Requirements for award with Honours

(1) Honours is available to meritorious candidates in the Bachelor of Laws and in an area of study within the Bachelor of Science by enrolling in the Bachelor of Advanced Studies and taking an embedded honours component after the completion of the pass Bachelor of Science degree.
(2) Candidates who qualify to undertake honours in the Bachelor of Science may elect to enrol in the honours program:
(a) by suspending candidature from the Bachelor of Laws degree for one year, with the permission of the University of Sydney Law School, and enrolling in the Bachelor of Advanced Studies and taking an embedded honours component; or
(b) by enrolling in the Bachelor of Advanced Studies and undertaking an embedded honours component after completion of both degrees in the combined program.
(3) For candidates completing the Bachelor of Science in a combined degree with the Bachelor of Laws and also completing an embedded honours component in the Bachelor of Advanced Studies, the requirement in the Bachelor of Advanced Studies for completion of a second major shall be met by the 48 credit points of Law units specified in 6 (3) (b) above.
(4) Honours in the Bachelor of Laws is available to meritorious students who complete an alternative set of units of study in the final year of the Combined Law program. Admission, requirements and calculation of the honours grade are as set out in the resolutions for the Bachelor of Laws.

10 Award of the degrees

(1) The Bachelor of Laws is awarded in the grades of either Pass or Honours.
(2) Candidates who successfully complete requirements for the Bachelor of Science as specified in 6 (4) and also complete an embedded honours component or a stream with the Bachelor of Advanced Studies shall be awarded the Bachelor of Science and the Bachelor of Advanced Studies with the appropriate stream or honours.
(3) Candidates who attempt the Bachelor of Science with an embedded honours component in the Bachelor of Advanced Studies who do not meet the requirements for honours but who meet the requirement for the pass degree, may be awarded the relevant degree or combined degree for which they fulfil requirements at pass level.
(4) Honours in the Bachelor of Laws may be awarded in First Class or Second Class in accordance with the Resolutions of the Bachelor of Laws.
(5) Candidates for the award of the Honours degree who do not meet the requirements,and who have not already graduated, will be awarded the relevant pass degree.
(6) For candidates qualifying for the Dalyell Stream, the words “Dalyell scholar” will beinserted below the degree name on the testamur.

11 Cross-institutional study

Cross-institutional study is available in this course subject to the terms set out in the Resolutions of the Faculty of Science during the first 144 credit points of the Combined degree and subsequently subject to the terms set out in the Resolutions of the University of Sydney Law School.

12 International exchange

The Faculty of Science and the University of Sydney Law School encourage candidates in this course to participate in international exchange programs subject to the terms set out in the Resolutions of the Faculty of Science during the first 144 credit points of the combined degree and subsequently subject to the terms set out in the Resolutions of the School ofLaw.

13 Course transfer

(1) A candidate may withdraw from the combined degree program and elect to transfer to the Bachelor of Science by written application to the Faculty of Science, and complete the requirements in accordance with the resolutions governing that degree at the time of transfer. Candidature in the Bachelor of Laws will cease in these circumstances.
(2) With the permission of the Faculty of Science and the University of Sydney Law School, suitably qualified candidates may, after completing requirements for the Bachelor of Science as specified in 6 (3) and 6 (4), defer progression to the Bachelor of Laws and undertake an embedded honours component in the Bachelor of Advanced Studies and then continue to the Bachelor of Laws.

(3) A candidate who has suspended enrolment in the combined degree to enrol in the Bachelor of Advanced Studies to complete requirements honours or a stream may abandon the Bachelor of Advanced Studies and return to the combined Bachelor of Science and Bachelor of Laws.

14 Credit for previous study

Credit transfer is subject to the relevant provisions of the Coursework Policy and the Resolutions of the Faculty of Science and the University of Sydney Law School.

15 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2018 who are not seeking credit for prior study and students who commenced their candidature prior to 1 January, 2018 who elect to proceed under these resolutions. Students who commenced their candidature prior to 1 January, 2018 who elect to transfer and proceed under these resolutions should note that the University does not undertake to offer 3000 level units of study prior to 2019 and that it may not be possible to complete requirements for the Bachelor of Science degree before the end of Semester 2 of that year or the single degree before the end of Semester 2, 2019.

(2) Candidates who commence candidature after 1 January, 2018 who are seeking credit for prior study should note that the University does not undertake to offer 2000 and 3000-level units of study prior to 2019 and that it may not be possible to complete requirements for the Bachelor of Science degree before the end of Semester 2 of that year. Where a student in the Bachelor of Science proceedingunder these resolutions applies for and is granted credit and wishes to complete the degree before 1 January 2020, the student will be offered the opportunity to complete the Bachelor of Science degree under the resolutions that applied at 1 January 2017.

(3) Candidates who commenced prior to 1 January, 2018 may complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that the requirements are completed by 1 January, 2027.

Bachelor of Science / Doctor of Dental Medicine

Bachelor of Science/Doctor of Dental Medicine

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty of Science and the Faculty of Dentistry, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BPSCIDMD-01	Bachelor of Science/Doctor of Dental Medicine

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) The Bachelor of Science in this double degree is available in the following stream:
(a) Dalyell.
(2) Completion of a stream is not a requirement of the Bachelor of Science/Doctor of Dental Medicine. The requirements for the completion of the stream is as specified in Table A for the Bachelor of Science or, in the case of the Dalyell stream, in Table S of the Shared Pool for Undergraduate Degrees.

4 Cross faculty management

(1) Candidates in this double degree program will be under the general supervision of the Faculty of Science until the end of the semester in which they complete the requirements for the Bachelor of Science. They will then be under the supervision of the Faculty of Dentistry.
(2) The Faculty of Science and the Faculty of Dentistry shall jointly exercise authority in any matter concerned with the double degree program not otherwise dealt with in these resolutions.

5 Admission to candidature

(1) Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents) leading to the award of an Australian Tertiary Admission Ranking (ATAR) or equivalent. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for Aboriginal and Torres Strait Islander people. Applicants are ranked by merit and offers for available places are issued according to the ranking. Details of admission policies are found in the Coursework Rule.
(2) Applicants are only eligible for assessment for admission to the first available course intake following the receipt of their final ATAR results or equivalent. Applicants are ineligible for admission to the course in subsequent years.
(3) Admission to this course requires the applicant to participate in an assessment process, including a written assessment and a panel discussion session. The result of this assessment will form part of the ranking of applicants.
(4) Admission to the Dalyell stream requires achievement of a minimum tertiary admission rank (ATAR) set by the Board of Interdisciplinary Studies, or equivalent standard.

6 Requirements for award

(1) The units of study that may be taken for the course are set out in;
(a) Table A for the Bachelor of Science; and
(b) Table S from the Shared Pool for Undergraduate Degrees; and
(c) Table O from the Shared Pool for Undergraduate Degrees; and
(d) The Table of units for the Doctor of Dental Medicine from the Faculty of Dentistry.
(2) In these resolutions, except where otherwise specified, Table A, Table S and Table O mean Table A, Table S and Table O as specified here.
(3) To qualify for the award of both degrees a candidate must successfully complete 336 credit points, comprising:
(a) 144 credit points to qualify for the award of the Bachelor of Science as specified in the resolutions for the Bachelor of Science, including;
(i) Degree core: 12 credit points of mathematics degree core units of study as set out in Table A (candidates may count the units from their major(s) or minor(s) to fulfil this requirement); and 12 credit points of 1000-level science elective units of study (excluding units listed as mathematics degree core) as set out in Table A (candidates may count the units from their major(s) or minor(s) to fulfil this requirement); and
(ii) A major (48 credit points) or program defined in Section 7 below and listed in Table A; and
(iii) A minor (36 credit points) or second major (48 credit points) as defined in Section 7 below and listed in Table A or Table S; and
(iv) 12 credit points of units of study in the Open Learning Environment as listed in Table O; and
(v) 6 credit points of foundational knowledge units of study for dentistry selected from BIOL1XX3, or BIOL1XX6, or BIOL1XX7 or BIOL1XX8 and one zero credit point unit of study (SDDP1011); and
(vi) Where appropriate, elective units from Table A and Table S; and
(vii) If enrolled in the Dalyell stream, complete the requirements for the stream as specified in Table A or Table S.
(b) 192 credit points to qualify for the award of the Doctor of Dental Medicine as specified in the resolutions for the Doctor of Dental Medicine.

7 Programs, majors and minors

(1) Completion of a major from Table A for the Bachelor of Science is a requirement for this double degree.
(2) Completion of a minor or second major from Table A or Table S is a requirement for this double degree.

(3) Candidates have the option of completing a program with an embedded major from Table A of up to 72 credit points.
(4) The programs and majors available as first majors in the Bachelor of Science are as specified in the resolutions for the Bachelor of Science, Bachelor of Science/Bachelor of Advanced Studies and in Table A.
(5) The minors and majors available as second majors in the Bachelor of Science are as specified in Table A and Table S.

8 Progression rules

(1) Progression within the Bachelor of Science
(a) Candidates must complete all requirements for the degree of Bachelor of Science, including the designated foundational knowledge units of study for dentistry offered by the Faculty of Science specified in 6 (3) (a) (v), within three years (or four years if candidates take an embedded honours component through the Bachelor of Advanced Studies), excluding any authorised periods of suspension.
(b) Candidates must achieve a Weighted Average Mark of at least 65.0 in each year of study for each 48 credit point block in the Bachelor of Science to continue in the double degree, this being the minimum achievement required for admission to candidature for the Doctor of Dental Medicine.
(c) Failure to maintain the minimum progression requirements will result in candidates being transferred from the double degree program to a Bachelor of Science degree with full credit for all units of study successfully completed.
(2) Progression within the Dalyell Stream
(a) With the permission of the Dalyell coordinator, candidates in the Dalyell Stream may attempt units of study at higher levels than the usual sequence.
(b) Candidates must achieve a WAM at a level determined by the Board of Interdisciplinary Studies in each year of study to continue in the Dalyell Stream. Candidates who do not maintain this WAM at the level determined by the Board of Interdisciplinary Studies may continue in the Bachelor of Science component of the double degree but will not remain in the Dalyell Stream.
(3) Progression within the Doctor of Dental Medicine
(a) Progression within the Doctor of Dental Medicine is as specified in the resolutions for the Doctor of Dental Medicine.

9 Requirements for award with Honours

(1) Honours in the Bachelor of Science is available to meritorious candidates who have completed requirements for the Bachelor of Science degree, by suspending candidature, with the permission of the Faculty of Science and Faculty of Dentistry, in the double degree for one year, enrolling in the Bachelor of Advanced Studies and taking an embedded honours component in an additional year of full time study.
(2) The grade of honours in the Bachelor of Advanced Studies will be determined by an honours mark calculated from work in the embedded honours component as specified in Table A and the Resolutions of the Faculty of Science.

10 Award of the degrees

(1) The Bachelor of Science is awarded at Pass level. Honours in science is taken by enrolling in the Bachelor of Advanced Studies and completing an embedded honours component.
(2) Candidates who attempt the Bachelor of Science with an embedded honours component in the Bachelor of Advanced Studies who do not meet the requirements for honours but who meet the requirement for the pass degree, may be awarded the relevant degree or degrees at pass level for which they fulfil requirements.
(3) Candidates who attempt the Bachelor of Science with an embedded honours component in the Bachelor of Advanced Studies who do not meet the requirements for honours but who meet the requirement for the pass degree, may be awarded the relevant degree or combined degree at pass level for which they fulfil requirements.
(4) The Doctor of Dental Medicine is awarded as a Pass grade.

11 Cross-institutional study

Cross institutional study is not available in this double degree course.

12 International exchange

The Faculty of Science encourages candidates in this course to participate in international exchange programs as set out in the Resolutions of the Faculty of Science provided that the progression requirements and timelines in Section 8 of these resolutions can be met.

13 Course Transfer

(1) A candidate may abandon the double degree program and elect to complete the Bachelor of Science in accordance with the resolutions governing that degree. Completion of the Doctor of Dental Medicine in the future will require a new application for admission to that course and completion in accordance with the resolutions governing that degree.
(2) With the permission of the Faculty of Science and the Faculty of Dentistry, suitably qualified candidates may, after completing requirements for the Bachelor of Science, defer progression to the Doctor of Dental Medicine and undertake an embedded honours component in the Bachelor of Advanced Studies and then, upon completion of the Bachelor of Advanced Studies, continue to the Doctor of Dental Medicine.
(3) A candidate who has suspended enrolment in the double degree program to enrol in the Bachelor of Advanced Studies to complete requirements of honours or a stream may, with the permission of the Faculty of Science and the Faculty of Dentistry, abandon the Bachelor of Advanced Studies and enrol in the Doctor of Dental Medicine.

14 Credit for previous study

It is not possible for candidates enrolled in the Bachelor of Science/ Doctor of Dental Medicine to obtain credit for previous studies.

15 Transitional provisions

(1) These resolutions apply to candidates who commenced their candidature after 1 January 2018 who are not seeking credit for prior study and candidates who commenced their candidature prior to 1 January 2018 who elect to proceed under these resolutions.
(2) Candidates who commenced their candidature prior to 1 January 2018 who elect to transfer and proceed under these resolutions, should note that the University does not undertake to offer 4000 level honours units of study in the Bachelor of Advanced Studies degree prior to 2020, nor 2000 or 3000 level units of study prior to 2019 and that it may not be possible to complete requirements for the Bachelor of Advanced Studies before the end of Semester 2 2020 or the Bachelor of Science component of the double degree before the end of Semester 2 2019.
(3) Candidates who commenced their candidature prior to 1 January 2018 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Bachelor of Science / Doctor of Medicine

Bachelor of Science/Doctor of Medicine

These resolutions must be read in conjunction with the applicable University By-Laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014 ('the Coursework Policy'), the Learning and Teaching Policy 2015, the Resolutions of the Faculty of Science, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BPSCIMED-01	Bachelor of Science/Doctor of Medicine

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) The Bachelor of Science in this double degree is available in the following streams:
(a) Medical Science
(b) Dalyell.
(2) Completion of a stream is not a requirement of the Bachelor of Science. The requirements for the completion of each stream are as specified in Table A for the Bachelor of Science or, in the case of the Dalyell stream, in Table S of the Shared Pool for Undergraduate Degrees.
(3) Candidates wishing to transfer between streams should contact the Student Centre.
(4) Candidates who qualify for the Dalyell stream may complete that stream while also completing another stream.

4 Cross faculty management

(1) Candidates in this double degree program will be under the general supervision of the Faculty of Science until the end of the semester in which they complete the requirements for the Bachelor of Science. They will then be under the supervision of the University of Sydney Medical School.
(2) The Faculty of Science and the University of Sydney Medical School shall jointly exercise authority in any matter concerned with the double degree program not otherwise dealt with in these resolutions.

5 Admission to candidature

(1) Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents) leading to the award of an Australian Tertiary Admission Ranking (ATAR) or equivalent. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for Aboriginal and Torres Strait Islander people. Applicants are ranked by merit and offers for available places are issued according to the ranking. Details of admission policies are found in the Coursework Rule.
(2) Applicants are only eligible for assessment for admission to the first available course intake following the receipt of their final ATAR results or equivalent. Applicants are ineligible for admission to the course in subsequent years.
(3) Admission to this course requires the applicant to participate in an assessment process, including a written assessment and a panel discussion session. The result of this assessment will form part of the ranking of applicants.
(4) Admission to the Dalyell stream requires achievement of a minimum tertiary admission rank (ATAR) set by the Board of Interdisciplinary Studies or equivalent standard.

6 Requirements for award

(1) The units of study that may be taken for the course are set out in:
(a) Table A for the Bachelor of Science; and
(b) Table S from the Shared Pool for Undergraduate Degrees; and
(c) Table O from the Shared Pool for Undergraduate Degrees; and
(d) The Table of units for the Doctor of Medicine from the Faculty of Medicine.
(2) In these resolutions, Table A, Table S, Table O mean Table A, Table S and Table O as specified here.
(3) To qualify for the award of both degrees a candidate must successfully complete 336 credit points, comprising:
(a) 144 credit points to qualify for the award of the Bachelor of Science as specified in the resolutions for the Bachelor of Science, including:
(i) 12 credit points of mathematics degree core units of study as set out in Table A (candidates may count the units from their major(s) or minor(s) to fulfil this requirement); and 12 credit points of 1000-level science elective units of study (excluding units listed as mathematics degree core) as set out in Table A (candidates may count the units from their major(s) or minor(s) to fulfil this requirement); and
(ii) A major (48 credit points) or program defined in Section 7 below and listed in Table A; and
(iii) A minor (36 credit points) or second major (48 credit points) as defined in Section 7 below and listed in Table A or Table S; and
(iv) 12 credit points of units of study in the Open Learning Environment as listed in Table O; and
(v) 18 credit points of foundational knowledge units of study for medicine offered by the Faculty of Science comprising BIOL1XX7, PHSI2X05 or MEDS2001, ANAT2011 or MEDS2005 and one zero credit point unit (SMTP3007); and
(vi) Where appropriate, elective units from Table A and Table S; and
(vii) If enrolled in a stream, complete the requirements for the stream as specified in Table A or Table S.
(b) 192 credit points to qualify for the award of the Doctor of Medicine as specified in the resolutions for the Doctor of Medicine.

7 Programs, majors and minors

(1) Completion of a major from Table A is a requirement for this double degree.
(2) Completion of a minor or second major from Table A or Table S is a requirement for this double degree.
(3) Candidates have the option of completing a program with an embedded major from Table A provided that the total credit point value of the program and the degree core does not exceed 78 credit points.
(4) The programs and majors available as first majors in the Bachelor of Science are as specified in the resolutions for the Bachelor of Science, Bachelor of Science/Bachelor of Advanced Studies and in Table A.
(5) The minors and majors available as second majors in the Bachelor of Science are as specified in Table A and Table S.

8 Progression rules

(1) Progression within the Bachelor of Science
(a) Candidates must complete all requirements for the degree of Bachelor of Science, including the designated foundational knowledge units of study for medicine offered by the Faculty of Science specified in (6) (3) (a) (v), within three years (or four years if candidates take an embedded honours component through the Bachelor of Advanced Studies), excluding any authorised periods of suspension, in order to progress to the Doctor of Medicine degree.
(b) Candidates must achieve an Annual Average Mark (AAM) of at least 65.0 in each year of study in the Bachelor of Science to continue in the double degree, this being the minimum achievement required for admission to candidature for the Doctor of Medicine.
(c) Failure to maintain the minimum progression requirements will result in candidates being transferred from the double degree program to a Bachelor of Science degree with full credit for all units of study successfully completed.
(2) Progression within the Dalyell Stream
(a) With the permission of the Dalyell coordinator, candidates in the Dalyell Stream may attempt units of study at higher levels than the usual sequence.
(b) Candidates must achieve an AAM at a level determined by the Board of Interdisciplinary Studies in each year of study to continue in the Dalyell Stream. Candidates who do not maintain this AAM at the level determined by the Board of Interdisciplinary Studies may continue in the Bachelor of Science component of the double degree, but will not remain in the Dalyell Stream.
(3) Progression within the Medical Science Stream
(a) Candidates in this stream will be required to meet the progression requirements for the stream as specified in the resolutions of the Bachelor of Science.
(4) Progression within the Doctor of Medicine is as specified in the resolutions for the Doctor of Medicine.
(a) Progression within the Doctor of Medicine is as specified in the Resolutions for the Doctor of Medicine.

9 Requirements for the award with Honours

(1) Honours in the Bachelor of Science is available to meritorious candidates who have completed requirements for the Bachelor of Science degree, by suspending candidature, with the permission of the Faculty of Science and the University of Sydney Medical School, in the double degree for one year, enrolling in the Bachelor of Advanced Studies and taking an embedded honours component in an additional year of full time study.
(2) The grade of honours in the Bachelor of Advanced Studies will be determined by an honours mark calculated from work in the embedded honours component as specified in Table A and the Resolutions of the Faculty of Science.

10 Award of the degrees

(1) The Bachelor of Science is awarded at Pass level. Honours in science is taken by enrolling in the Bachelor of Advanced Studies and completing an embedded honours component.
(2) Candidates who attempt the Bachelor of Science with an embedded honours component in the Bachelor of Advanced Studies who do not meet the requirements for honours but who meet the requirement for the pass degree, may be awarded the relevant degree ordegrees at pass level for which they fulfil requirements.
(3) The Doctor of Medicine is awarded as a Pass grade.

11 Cross-institutional study

Cross institutional study is not available in this double degree course.

12 International exchange

The Faculty of Science encourages candidates in this course to participate in international exchange programs while undertaking the Bachelor of Science as specified in the Resolutions of the Faculty of Science provided that the progression requirements and timelines in Section 8 of these resolutions can be met.

13 Course transfer

(1) A candidate may abandon the double degree program and elect to complete the Bachelor of Science in accordance with the resolutions governing the degree. Completion of the Doctor of Medicine in the future will require a new application for admission to that course and completion in accordance with the resolutions governing that degree.
(2) With the permission of the Faculty of Science and the University of Sydney Medical School, suitably qualified candidates may, after completing requirements for the Bachelor of Science, defer progression to the Doctor of Medicine and undertake an embedded honours component in the Bachelor of Advanced Studies, and, upon completion of the Bachelor of Advanced Studies, continue to the Doctor of Dental Medicine.
(3) A candidate who has suspended enrolment in the double degree to enrol in the Bachelor of Advanced Studies to complete requirements of honours or a stream may, with the permission of the Faculty of Science and the Faculty of Medicine, abandon the Bachelor of Advanced Studies and enrol in the Doctor of Medicine.

14 Credit for previous study

It is not possible for candidates enrolled in the Bachelor of Science / Doctor of Medicine to obtain credit for previous studies.

15 Transitional provisions

(1) These resolutions apply to candidates who commenced their candidature after 1 January, 2018 and candidates who commenced their candidature prior to 1 January, 2018 who elect to proceed under these resolutions.
(2) Candidates who commenced their candidature prior to 1 January, 2018 who elect to transfer and proceed under these resolutions should note that the University does not undertake to offer 4000 level honours units of study in the Bachelor of Advanced Studies degree prior to 2020 nor 2000 or 3000 level units of study prior to 2019 and that it may not be possible to complete requirements for the Bachelor of Advanced Studies before the end of Semester 2 2020 or the Bachelor of Science component of the double degree before the end of Semester 2 2019.
(3) Candidates who commenced their candidature prior to 1 January 2018 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Bachelor of Science / Master of Nutrition and Dietetics

Bachelor of Science/ Master of Nutrition and Dietetics

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BPSCINUD-02	Bachelor of Science / Master of Nutrition and Dietetics
MANUTDIE-01	Master of Nutrition and Dietetics

2 Attendance pattern

The attendance pattern for the Bachelor of Science is full time or part time according to student choice, whereas the attendance pattern for the Master of Nutrition and Dietetics is full time only.

3 Streams

(1) The Bachelor of Science and Master of Nutrition and Dietetics is available in the following stream:
(b) Dalyell.
(2) Completion of a stream is not a requirement of the Bachelor of Science and Master of Nutrition and Dietetics. The requirements for the completion of each stream are as specified in Table A for the Bachelor of Science or, in the case of the Dalyell stream, in Table S of the Shared Pool for Undergraduate Degrees.
(3) Candidates wishing to transfer between streams should contact the Student Centre.
(4) Candidates who qualify for the Dalyell stream may complete that stream while also completing another stream.

4 Master's type

The master's degree in these resolutions is a professional master's course, as defined by the Coursework Rule. It is accredited by the Dietitians Association of Australia.

5 Admission to candidature

(1) Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents), tertiary study or an approved preparation program. English language requirements must be metwhere these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for Aboriginal and Torres Strait Islander people. Applicants are ranked by merit and offers for available places are issued according to the ranking.Details of admission policies are found in the Coursework Rule and the Coursework Policy.
(2) Admission to the Dalyell stream requires achievement of a minimum tertiary admission rank (ATAR) set by the Board of Interdisciplinary Studies, or equivalent standard.

6 Requirements for award

(1) The units of study that may be taken for the course are set out in:
(a) Table A for the Bachelor of Science;
(b) Table S of the Shared Pool for Undergraduate Degrees;
(c) Table O of the Shared Pool for Undergraduate Degrees; and
(d) The Table of units for the Master of Nutrition and Dietetics from the Faculty of Science.
(e) In these resolutions, except where otherwise specified, Table A, Table S and Table O mean Table A, Table S and Table O as specified here.
(2) To qualify for the award of both degrees a candidate must successfully complete 240 credit points, comprising:
(a) 144 credit points to qualify for the award of the Bachelor of Science as specified in resolutions for the Bachelor of Science, including:
(i) 12 credit points of mathematics degree core units of study as set out in Table A (students may count the units from their major(s) or minor(s) to fulfil this requirement);
(ii) 12 credit points of 1000-level science elective units of study (excluding units listed as Mathematics degree core) as set out in Table A (students may count the units from their major(s) or minor(s) to fulfil this requirement);
(iii) a program (72 credit points) in Nutrition and Dietetics as defined in Section 7 below and specified in Table A;
(iv) a minor (36 credit points) or second major (48 credit points) as defined in Table A or Table S;
(v) 12 credit points of units of study in the Open Learning Environment as listed in Table O;
(vi) where appropriate, elective units from Table A and Table S; and
(vii) if enrolled in a stream, complete the requirements for the stream as specified in Table A or Table S.
(b) 96 credit points for the award of the Master of Nutrition and Dietetics as required by the resolutions and Table of units for the Master of Nutrition and Dietetics.

7 Programs, majors and minors

(1) Completion of a program in Nutrition and Dietetics from Table A for the Bachelor of Science is a requirement for this double degree.
(2) Completion of a minor or second major from Table A or Table S is a requirement for this double degree.
(3) The minors and majors available as second majors in the Bachelor of Science are as specified in Table A and Table S.

8 Progression rules

(1) Candidates must complete the requirements for the Bachelor of Science with a Weighted Average Mark of at least 65 in order to be eligible to proceed to the Master of Nutrition and Dietetics.

(2) Candidates who complete the requirements for the Bachelor of Science but fail to achieve a WAM of 65 will not progress to the Master of Nutrition and Dietetics and will be awarded the Bachelor of Science only.

(3) *Progression within the Dalyell Stream:*

(a) With the permission of the Dalyell coordinator, candidates in the Dalyell Stream may attempt units at higher levels than the usual sequence.

(b) Candidates must achieve an Annual Average Mark at a level determined by the Board of Interdisciplinary Studies or over for each 48 credit-point block to continue in theDalyell Stream. Candidates who do not maintain an Annual Average Mark at the level determined by the Board of Interdisciplinary Studies may continue in any other stream into which they were admitted, major, program or minor but will not remain in the Dalyell Stream.

9 Requirements for the Bachelor of Science with honours

(1) Honours in the Bachelor of Science is available to meritorious candidates who havecompleted requirements for the Bachelor of Science degree, by suspending candidature,with the permission of the Faculty of Science, in the double degree for one year, enrolling inthe Bachelor of Advanced Studies and taking an embedded honours component in anadditional year of full time study.

(2) The grade of honours in the Bachelor of Advanced Studies will be determined by anhonours mark calculated from work in the embedded honours component as specified inTable A and the Resolutions of the Faculty of Science.

10 Award of the degree

(1) The Bachelor of Science is awarded at Pass level. Honours in science is taken by enrolling in the Bachelor of Advanced Studies and completing an embedded honours component.

(2) Candidates who attempt the Bachelor of Science with an embedded honours component in the Bachelor of Advanced Studies who do not meet the requirements for honours but who meet the requirement for the pass degree, may be awarded the relevant degree or degrees at pass level for which they fulfil requirements.

(3) The Master of Nutrition and Dietetics is awarded as a Pass degree only.

11 Course transfer

(1) A candidate may abandon the double degree program and elect to complete the Bachelor of Science in accordance with the resolutions governing that degree. Completion of the Master of Nutrition and Dietetics in the future will require a new application for admission to that course and completion in accordance with the resolutions governing that degree.

(2) With the permission of the Faculty of Science, suitably qualified candidates may, after completing requirements for the Bachelor of Science, defer progression to the Master of Nutrition and Dietetics and undertake an embedded honours component in the Bachelor ofAdvanced Studies and then, upon completion of the Bachelor of Advanced Studies, continue to the Master of Nutrition and Dietetics.

(3) A candidate who has suspended enrolment in the double degree program to enrol in the Bachelor of Advanced Studies to complete requirements of honours or a stream may, with the permission of the Faculty of Science, abandon the Bachelor of Advanced Studies and enrol in the Master of Nutrition and Dietetics.

12 Transitional provisions

These resolutions apply to students who commenced their candidature after 1 January, 2018 who are not seeking credit for prior study and students who commenced theircandidature prior to 1 January, 2018 who elect to proceed under these resolutions. Students who commenced their candidature prior to 1 January 2018 who elect to transfer and proceed under these resolutions should note that the University does not undertake to offer 4000 level honours units in the Bachelor of Advanced Studies degree prior to 2020 and 2000 and 3000 level units of study prior to 2019 and that it may not be possible to complete requirements for the Bachelor of Advanced Studies before the end of Semester 2 2020 or the Bachelor of Science before the end of Semester 2 2019.

(2) Candidates who commenced prior to 1 January 2018 may complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that the requirements are completed by 1 January 2027.

Bachelor of Veterinary Biology / Doctor of Veterinary Medicine

Bachelor of Veterinary Biology / Doctor of Veterinary Medicine

These resolutions must be read in conjunction with the applicable University By-Laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014 ('the Coursework Policy'), the Learning and Teaching Policy 2015, the Resolutions of the Faculty of Science, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BPVBLVMD-01	Bachelor of Veterinary Biology/Doctor of Veterinary Medicine
BHVETBIO-01	Bachelor of Veterinary Biology (Honours)

2 Attendance pattern

1. The attendance pattern for Year 1 and Year 2 of the Bachelor of Veterinary Biology is full time or part-time according to candidate choice.
2. The attendance pattern for Year 3 to Year 6 is full-time only.

3 Admission to candidature

(1) Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents) and tertiary study. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for educationally disadvantaged applicants, rural applicants and for Aboriginal and Torres Strait Islander people. Applicants are ranked by merit and offers for available places are issued according to the ranking. Details of admission policies are found in the Coursework Rule. In addition, admission to this course requires the applicant to submit a Commitment to Veterinary Science Form. The results of this process will form part of the ranking of applicants.

4 Requirements for award

(1) The units of study that may be taken for the course are set out in the Table of units of study for the Bachelor Veterinary Biology/Doctor of Veterinary Medicine.
(2) To qualify for the award of both degrees, a candidate must successfully complete 288 credit points comprising:
(a) 144 credit points from the Bachelor of Veterinary Biology, and
(b) 144 credit points from the Doctor of Veterinary Medicine.

5 Progression rules

Progression to Year 3 of the course is based on successful completion of Year 1 and Year 2 of the course and academic merit in Year 1 and Year 2 of the course.

(1) All students who have successfully completed Year 1 and Year 2 with a Weighted Average Mark (WAM) of 65.0 or greater at the end of Year 2 will be eligible for progression to Year 3.
(2) Students who have successfully completed Year 1 and Year 2 with a Year 1 plus Year 2 WAM of less than 65.0 will not be eligible for entry into Year 3 of the course.
(3) Students who commenced prior to 1 Januray 2018 and who fail to achieve progression into Year 3 of the combined course will be transferred to the Bachelor of Science or the Bachelor of Animal and Veterinary Bioscience until 2019.
(4) Students who commenced prior to 1 January, 2018 and who fail to achieve progression into Year 3 of the combined course will be transferred to the Bachelor of Science or the Bachelor of Science/Bachelor of Advanced Studies (AVBS) from 2020.
(5) Students who commenced after 1 January 2018 and who fail to achieve progression into Year 3 of the combined course will be transferred into the Bachelor of Science (no stream), or the Bachelor of Science/Bachelor of Advanced Studies (AVBS stream) with credit for the units of study completed.
(6) Students for the course may enrol in the units of study prescribed for Year 4 of candidature only after completion of Year 1, Year 2 and Year 3.
(7) Students for the course may enrol in the units of study prescribed for Year 5 of candidature only after completion of Year 1, Year 2, Year 3 and Year 4
(8) Students for the course may enrol in the units of study prescribed for Year 6 of candidature only after completion of Year 1, Year 2, Year 3, Year 4 and Year 5.

6 Requirements for the Honours degree

(1) Honours in the Bachelor of Veterinary Biology is available to meritorious candidates who complete an additional year of full time study, after the successful completion of Year 3. Students must complete the requirements for the honours course full-time over two consecutive semesters. If the Faculty is satisfied that a student is unable to attempt the honours course on a full time basis and if the Dean so recommends, permission may be granted to undertake honours part-time over four consecutive semesters.
(2) Students who qualify to undertake honours in the Bachelor of Veterinary Biology may elect to enrol in the honours programme:
(a) by suspending candidature from the Bachelor of Veterinary Biology/Doctor of Veterinary Medicine for one year after successful completion of Year 3 or Year 4 or Year 5, with the permission of the Faculty; or
(b) by undertaking the honours course after completion of both courses in the combined course.

7 Award of the degree

(1) The Bachelor of Veterinary Biology/Doctor of Veterinary Medicine is awarded as either Pass or Honours. The honours degree, Bachelor of Veterinary Biology Honours/Doctor of Veterinary Medicine, is awarded in classes ranging from First Class to Third Class.
(2) The grade of honours and the honours mark are determined by performance in the honours course.
(3) Honours is awarded in the following classes:

Description	Mark range
Honours Class I	Mark >= 80
Honours Class II (Division 1)	75 <= Mark < 80
Honours Class II (Division 2)	70 <= Mark < 75
Honours Class III	65<= Mark < 70
Honours not awarded	Mark < 65

Candidates for the award of the Honours degree who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

8 Course transfer

A candidate may abandon the combined programme and elect to complete a Bachelor of Science or Bachelor of Animal and Veterinary Bioscience in accordance with the resolutions governing that degree. Candidates who discontinue after Year 3 without completing the combined course, but have satisfactorily completed 144 credit points including all requirements for Year 1, Year 2 and Year 3 may exit with the Bachelor of Veterinary Biology. Completion of the Doctor of Veterinary Medicine in the future will require a new application for admission to that course and completion in accordance with the resolutions governing that course.

9 Reassessment

Students enrolled in a postgraduate unit of study prescribed for Year 3, Year 4, Year 5 or Year 6 of candidature of the Bachelor of Veterinary Biology/Doctor of Veterinary Medicine, who fail one unit of study only within a semester may be offered the opportunity for re-assessment for the failed unit of study.

(a) The scope of the re-assessment will encompass all topics and learning outcomes within the unit of study. The methods used for re-assessment may differ from those used in the original delivery of the unit.

(b) Re-assessment will only be offered to eligible students on the dates prescribed in the year schedule, and it is the student's responsibility to be available to attend at these times.

(c) The maximum mark awarded for a unit of study in these circumstances will be Pass (50 - PS for units of study with Mark and Grade assessment type or SR for units of study with Grade only (Pass/Fail) assessment type).

(d) Students who have been awarded an Absent Fail grade for a unit of study will not be eligible for re-assessment for that unit of study.

10 Transitional Provisions

These provisions apply for candidates who commenced after 1 Januray 2015.

Bachelor of Veterinary Biology / Doctor of Veterinary Medicine

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Bachelor of Veterinary Biology/Doctor of Veterinary Medicine			
Year 1			
Year 1 has the following 48 credit point structure: a core (36 credit points), and electives (12 credit points) selected from the lists below.			
Core Units of Study			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
or			
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
or			
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
or			
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
or			
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
or			
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
or			
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
CHEM1112 **Chemistry 1B**	6	**P** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992	Semester 1 Semester 2
or			
CHEM1912 **Chemistry 1B (Advanced)**	6	**P** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 *Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.*	Semester 2
or			
CHEM1992 **Chemistry 1B (Special Studies Program)**	6	**P** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 *Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.*	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
AVBS1002 **Concepts of Animal Management**	6	**A** AGEN1004 or BIOL1XXX or AVBS1003 **N** AGEN2006	Semester 2
Or (for students who commenced the course in or before 2017)			
AVBS1003 **Animals and Us**	6	**N** VETS1018	Semester 1
Electives			
Bachelor of Animal and Veterinary Bioscience (Progression Strategy) for students who commenced the course in or before 2017			
ENVI1003 **Global Challenges: Food, Water, Climate**	6		Semester 2
AVBS1002 **Concepts of Animal Management**	6	**A** AGEN1004 or BIOL1XXX or AVBS1003 **N** AGEN2006	Semester 2
Bachelor of Science (Progression Strategy) for students who commenced the course in or before 2017			
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
PSYC1001 **Psychology 1001**	6		Intensive June Semester 1 Summer Main
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics or PHYS1003 or PHYS1004 or PHYS1902 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **N** PHYS1002 or PHYS1901 or EDUH1017 or PHYS1903	Semester 1
PHYS1004 **Physics 1 (Environmental and Life Science)**	6	**A** HSC Physics or PHYS1001 or PHYS1002 or PHYS1901 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **N** PHYS1003 or PHYS1902 or PHYS1904 *It is recommended that PHYS1001 or PHYS1002 or PHYS1901 be completed before this unit*	Semester 2
MATH1004 **Discrete Mathematics**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1904 or MATH1064 or MATH2011	Semester 2 Summer Main
MATH1013 **Mathematical Modelling**	3	**A** HSC Mathematics or a credit or higher in MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1003 or MATH1903 or MATH1907 or MATH1023 or MATH1923 or MATH1933	Semester 2 Summer Main
MATH1014 **Introduction to Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1012 or MATH1002 or MATH1902	Semester 2
Bachelor of Science/Bachelor of Advanced Studies (Animal and Veterinary Bioscience) (Progression Strategy) for students commencing the course in or after 2018			
AVBS1003 **Animals and Us**	6	**N** VETS1018	Semester 1
And 6 credit points of 1000-level units from any of the areas of study listed in Science Table A			
Bachelor of Science (Progression Strategy) for students commencing the course in or after 2018			
6 credit points of MATH1XXX units from the BSc Core units of study, and			
6 credit points of 1000-level units from any of the areas of study listed in Science Table A, excluding Mathematics units of study			
Year 2			
Year 2 has the following 48 credit point structure: a core (36 credit points), and electives (12 credit points) selected from the lists below.			
Core Units of Study for students commencing the course in or after 2018			
AVBS2001 **Introductory Veterinary Pathogenesis**	6	**A** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **P** 6cp of BIOL1XXX or MBLG1XX1	Semester 2
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
or			
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
AVBS2002-2005 to be developed for offiering in 2019.			
Core Units of Study for students who commenced the course in or before 2017			
ANSC3101 **Animal Nutrition 3**	6	**A** Fundamentals of Biochemistry **P** AVBS2001 and [VETS1032 or AGEN2001 or (MICR2X31 or MICR2024)] **C** AVBS2001 and MICR2X31	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ANSC3103 **Animal Structure and Function A**	6	**A** AVBS1002 **P** 12cp from (BIOL1XXX, VETS1032, AGEN2001)	Semester 1
ANSC3104 **Animal Structure and Function B**	6	**P** ANSC3103	Semester 2
AVBS2001 **Introductory Veterinary Pathogenesis**	6	**A** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **P** 6cp of BIOL1XXX or MBLG1XX1	Semester 2
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
or			
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
Students who commenced the course in or before 2017 are advised to take GEGE2X01 in semester 1.			
VETS1032 **Animal Energetics and Homeostasis**	6	**A** HSC level chemistry and/or biology would be an advantage	Semester 1
Electives			
Bachelor of Animal and Veterinary Bioscience (Progression Strategy) for students who commenced the course in or before 2017			
BIOL2032 **Australian Wildlife Biology**	6	**N** ANSC2005	Semester 2
ENVX2001 **Applied Statistical Methods**	6	**P** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
Bachelor of Science (Progression Strategy) - subject to approval for students who commenced the course in or before 2017			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
BCMB2002 **Proteins in Cells**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2902	Semester 2
BCMB2902 **Proteins in Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2002	Semester 2
BIOL2021 **Zoology**	6	**A** BIOL1XXX or MBLG1XXX **N** BIOL2921 or BIOL2011 or BIOL2911 or BIOL2012 or BIOL2912	Semester 1
BIOL2022 **Biology Experimental Design and Analysis**	6	**A** BIOL1XXX or MBLG1XXX **P** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **N** BIOL2922 or BIOL3006 or BIOL3906	Semester 2
CHEM2401 **Molecular Reactivity and Spectroscopy**	6	**A** 6cp MATH1XXX **P** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 or CHEM2915 *This is a required chemistry unit of study for students intending to major in chemistry.*	Semester 1
CHEM2402 **Chemical Structure and Stability**	6	**A** 6cp MATH1XXX **P** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **N** CHEM2202 or CHEM2302 or CHEM2902 or CHEM2912 or CHEM2916 *This is a required chemistry unit of study for students intending to major in chemistry.*	Semester 2
Bachelor of Science/Bachelor of Advanced Studies (Animal and Veterinary Bioscience) (Progression Strategy) for students commencing the course in or after 2018			
ENVX2001 **Applied Statistical Methods**	6	**P** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
And 6 credit points of 2000-level units from Science Table A that enables the completion of a second major.			
Bachelor of Science (Progression Strategy) for students commencing the course in or after 2018			
12 credit points of 2000-level units from Science Table A			
Years 3 to 6			
Candidates who successfully complete the progression requirements enrol in the units of study for the Doctor of Veterinary Medicine degree.			
The requirements for the Doctor of Veterinary Medicine degree are set out in the Science Postgraduate Handbook.			
Doctor of Veterinary Medicine			
Year 1 has the following 48 credit point structure:			
VETS6101 **The Veterinary Professional 1**	3	**A** One semester of study in each of: general chemistry (physical and inorganic), organic chemistry, biology and biochemistry.	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
VETS6102 **Professional Skills 1A**	6	**A** Basic knowledge of clinical veterinary practice; empathy for and confidence in interactions with animals, One semester of study in each of general chemistry (physical and inorganic), organic chemistry, biology and biochemistry.	Semester 1
VETS6103 **Research and Enquiry 1A**	3		Semester 1
VETS6104 **Foundations of Veterinary Science A**	12	**A** One semester of study in each of general chemistry (physical and inorganic), organic chemistry, biology and biochemistry.	Semester 1
VETS6105 **Animal Management Systems 1**	3	**A** Basic knowledge of clinical veterinary practice, one semester of study in each of general chemistry (physical and inorganic), organic chemistry, biology and biochemistry **P** VETS6102	Semester 2
VETS6106 **Professional Skills 1B**	6	**A** Basic knowledge of clinical veterinary practice; empathy for and confidence in interactions with animals, one semester of study in each of general chemistry (physical and inorganic), organic chemistry, biology and biochemistry **P** VETS6102	Semester 2
VETS6107 **Research and Enquiry 1B**	3	**P** VETS6103	Semester 2
VETS6108 **Foundations of Veterinary Science B**	12	**A** 2 semesters of chemistry, 1 semester of biology, 1 semester of biochemistry **P** VETS6104	Semester 2
Year 2 has the following 48 credit point structure:			
VETS6201 **The Veterinary Professional 2**	3	**P** VETS6101 and VETS6102 and VETS6103 and VETS6104 and VETS6105 and VETS6106 and VETS6107 and VETS6108	Semester 1
VETS6202 **Professional Skills 2A**	6	**P** VETS6101 and VETS6102 and VETS6103 and VETS6104 and VETS6105 and VETS6106 and VETS6107 and VETS6108 *It is assumed that student have a basic knowledge of clinical veterinary practice; empathy for and confidence in interactions with animals*	Semester 1
VETS6203 **Research and Enquiry 2A**	3	**P** VETS6101 and VETS6102 and VETS6103 and VETS6104 and VETS6105 and VETS6106 and VETS6107 and VETS6108	Semester 1
VETS6204 **Principles of Animal Disease A**	12	**P** VETS6101 and VETS6102 and VETS6103 and VETS6104 and VETS6105 and VETS6106 and VETS6107 and VETS6108	Semester 1
VETS6205 **Animal Management Systems 2**	3	**P** VETS6101 and VETS6102 and VETS6103 and VETS6104 and VETS6105 and VETS6106 and VETS6107 and VETS6108 and VETS6201 and VETS6202 and VETS6203 and VETS6204 *It is assumed that students have a basic knowledge of clinical veterinary practice, biology and biochemistry*	Semester 2
VETS6206 **Professional Skills 2B**	6	**P** VETS6101 and VETS6102 and VETS6103 and VETS6104 and VETS6105 and VETS6106 and VETS6107 and VETS6108 and VETS6201 and VETS6202 and VETS6203 and VETS6204 *It is assumed that student have a basic knowledge of clinical veterinary practice; empathy for and confidence in interactions with animals*	Semester 2
VETS6207 **Research and Enquiry 2B**	3	**P** VETS6101 and VETS6102 and VETS6103 and VETS6104 and VETS6105 and VETS6106 and VETS6107 and VETS6108 and VETS6201 and VETS6202 and VETS6203 and VETS6204	Semester 2
VETS6208 **Principles of Animal Disease B**	12	**P** VETS6101 and VETS6102 and VETS6103 and VETS6104 and VETS6105 and VETS6106 and VETS6107 and VETS6108 and VETS6201 and VETS6202 and VETS6203 and VETS6204	Semester 2
Year 3 has the following 48 credit point structure:			
VETS6301 **Veterinary Public Practice**	3	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208	Semester 1
VETS6302 **Clinical Foundations**	3	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208	Semester 1
VETS6303 **Small Animal Practice A**	6	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208 **C** VETS6302	Semester 1
VETS6304 **Livestock Practice A**	3	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208 **C** VETS6302	Semester 1
VETS6305 **Equine Practice A**	3	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208 **C** VETS6302	Semester 1
VETS6306 **Exotic and Wildlife Practice**	3	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208 **C** VETS6302	Semester 1
VETS6307 **Research and Enquiry 3A**	3	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208	Semester 1
VETS6308 **Veterinary Practice Management**	3	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208	Semester 2
VETS6309 **Small Animal Practice B**	6	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6303	Semester 2
VETS6310 **Livestock Practice B**	6	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6304	Semester 2
VETS6311 **Equine Practice B**	3	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6305	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
VETS6312 **Intensive Animal Practice**	3	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6302	Semester 2
VETS6313 **Research and Enquiry 3B**	3	**P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208	Semester 2
Year 4 has the following 48 credit point structure:			
VETS6401 **Small Animal Clinics A**	6	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313 *The majority of the unit of study will involve practical work in the form of clinical practice, facilitated in a rotational format. Students will be involved in the handling, examination, diagnostic procedures and treatment of various small animal species.*	Semester 1 Semester 2
VETS6402 **Small Animal Clinics B**	6	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313 *This unit of study involved four weeks of practical clinical experience at the UVTHS, focusing on developing clinical knowledge and skills in the area of veterinary anaesthesia.*	Semester 1 Semester 2
VETS6403 **Small Animal Clinics C**	6	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313 *The majority of the unit of study will involve practical work in the form of clinical practice, facilitated in a rotational format. Students will be involved in the handling, examination, diagnostic procedures and treatment of dogs, cats, birds, reptiles, exotic pets and wildlife.*	Semester 1 Semester 2
VETS6404 **Small Animal Clinics D**	3	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313 *The majority of the unit of study will involve practical work in the form of general clinical practice. Students will be involved in the handling, examination, diagnostic procedures and treatment, and wellness management of animals commonly presented in small animals practice.*	Semester 1 Semester 2
VETS6405 **Large Animal Clinics A**	6	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313 *Four weeks of practical experience in clinical environments focusing on multiple disciplinary areas required to facilitate effective equine clinical assessment and care.*	Semester 1 Semester 2
VETS6406 **Large Animal Clinics B**	3	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313 *Two weeks of clinical practical experience in working with livestock, ruminant, and herd populations via the University Livestock Veterinary Service at Camden campus.*	Semester 1 Semester 2
VETS6407 **Lab Investigations of Clinical Disease**	3	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313 *The unit of study is entirely practical, utilising diagnostic accessions to perform and interpret laboratory testing.*	Semester 1 Semester 2
VETS6408 **Public, Industry, or Community Placement**	3	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105, VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313 *Four weeks of practical experience of professional practice as required within a public, industry, or community-based body that serves the public good and/or underprivileged communities that lack regular access to veterinary services directly involved in servicing the livestock industries and/or public health. Students will also undertake a 3-day placement at an export abattoir.*	Semester 1 Semester 2
VETS6409 **Extramural Placement 1**	3	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105,VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313	Semester 1 Semester 2
VETS6410 **Extramural Placement 2**	3	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105,VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313	Semester 1 Semester 2
VETS6411 **Extramural Placement 3**	3	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105,VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
VETS6412 **Extramural Placement 4**	3	**A** All content from Years 1, 2, and 3 of the DVM **P** VETS6101, VETS6102, VETS6103, VETS6104, VETS6105,VETS6106, VETS6107, VETS6108, VETS6201, VETS6202, VETS6203, VETS6204, VETS6205, VETS6206, VETS6207, VETS6208, VETS6301, VETS6302, VETS6303, VETS6304, VETS6305, VETS6306, VETS6307, VETS6308, VETS6309, VETS6310, VETS6311, VETS6312, VETS6313	Semester 1 Semester 2

Resolutions of the Senate

Resolutions of the Senate

1 Degrees, diplomas and certificates of the Faculty of Science

(1) With the exception of the Doctor of Science, the Doctor of Philosophy, the Doctor of Agricultural Economics, the Doctor of Science in Agriculture, and the Doctor of Veterinary Science, the Senate, by authority of the University of Sydney Act 1989 (as amended), provides and confers the following degrees, diplomas and certificates, according to the rules specified by the Faculty of Science. The Doctor of Science, the Doctor of Philosophy, the Doctor of Agricultural Economics, the Doctor of Science in Agriculture, and the Doctor of Veterinary Science, are provided and conferred according to the rules specified by the Senate and the Academic Board.

(2) This list is amended with effect from 1 January, 2018. Degrees, diplomas and certificates no longer open for admission will be conferred by the Senate according to the rules specified by the Faculty at the time.

2 Degrees

Code	Course title & stream	Abbreviation	Credit points
RHSCIENC-01	Doctor of Science	DSc	Published Work
RHAGRECO-01	Doctor of Agricultural Economics	DAgrEc	Published Work
RHSCAGRI-01	Doctor of Science in Agriculture	DScAgr	Published Work
RHVETSCI-01	Doctor of Veterinary Science	DVSc	Published Work
RPPHDSCI-01	Doctor of Philosophy	PhD	Published Work
RPPHDAGR-01	Doctor of Philosophy *(no new intake from 2017)*	PhD	Published Work
RPPHDVET-01	Doctor of Philosophy *(no new intake from 2017)*	PhD	Published Work
RMPHLSCI-01	Master of Philosophy	MPhil	Research
RMPHLAGR-01	Master of Philosophy *(no new intake from 2017)*	MPhil	Research
MASCIENC-01	Master of Science *(no new intake from 2016)*	MSc	Research
RMSCVESC-01	Master of Science in Veterinary Science *(no new intake from 2017)*	MScVetSc	Research
RMVETCLS-01	Master of Veterinary Clinical Studies	MVetClinStud	Research
RMVETSCI-01	Master of Veterinary Science *(no new intake from 2017)*	MVSc	Research
MASCPSCO-01	Master of Science in Coaching Psychology	MSc(CoachPsyc)	48
MAMASCMG-02	Master of Marine Science and Management	MMarSciMgt	72
MAENVSCI-01	Master of Environmental Science	MEnviSci	72
MAENSCLA-02	Master of Environmental Science and Law	MEnviSciLaw	72
MAMEDPHY-01	Master of Medical Physics	MMedPhys	72
MANUTDIE-01	Master of Nutrition and Dietetics	MNutrDiet	96
MASUSTAI-01	Master of Sustainability	MSust	72
MACLIPSY-01	Master of Clinical Psychology	MCP	96
MAAGRENV-01	Master of Agriculture and Environment	MAgrEnv	72
MAANMSCI-01	Master of Animal Science *(no new intake from 2018)*	MAnimSc	72
MAASCABM-01	Animal Breeding Management (available by distance online only) *(no new intake from 2018)*	MAnimSc(ABMgt)	72
	Animal Genetics *(no new intake from 2018)*	MAnimSc(Animal Genetics)	72
	Animal Nutrition *(no new intake from 2018)*	MAnimSc(Animal Nutrition)	72
	Animal Reproduction *(no new intake from 2018)*	MAnimSc(Animal Reproduction)	72
MAVETPHE-01	Master of Veterinary Public Health *(no new intake from 2017)*	MVPH	48
MAVEPHMA-01	Master of Veterinary Public Health Management *(no new intake from 2018)*	MVPHMgt	48
MAVETSTD-02	Master of Veterinary Studies *(no new intake from 2018)*	MVetStud	72
MAVETSTD-03	Master of Veterinary Studies (Small Animal Clinical Studies)	MVetStud(Small Animal Clinical Studies)	48
MAWIHEPM-01	Master of Wildlife Health and Population Management *(no new intake from 2018)*	MWHPMgt	72

Code	Course title & stream	Abbreviation	Credit points
MAVETMED-01	Doctor of Veterinary Medicine	DVM	192
BPLIARSC-01	Bachelor of Liberal Arts and Science*	BLAS	144
BPMEDSCI-02	Bachelor of Medical Science* *(no new intake from 2018)*	BMedSc	144
BPPSYCHO-02	Bachelor of Psychology*	BPsych	192
BPSCIENC-05	Bachelor of Science*	BSc	144
	Dalyell		
	Health		
	Medical Science		
	Advanced* *(no new intake from 2018)*	BSc(Advanced)	144
	Advanced Mathematics* *(no new intake from 2018)*	BSc(Advanced Mathematics)	144
BUAGRECO-01	Bachelor of Agricultural Economics *(no new intake from 2015)^*	BAgrEc	192
BUFDAGBU-01	Bachelor of Food and Agribusiness^ *(no new intake from 2018)*	BFoodAgrib	192
BPENVSYS-01	Bachelor of Environmental Systems *(no new intake from 2017)**	BEnvSys	144
BURESECN-01	Bachelor of Resource Economics *(no new intake from 2015)^*	BResEc	192
BUSCAGRI-01	Bachelor of Science in Agriculture^ *(no new intake from 2018)*	BScAgr	192
BUANVEBI-01	Bachelor of Animal and Veterinary Bioscience^ *(no new intake from 2018)*	BAnVetBioSc	192
BUSCVETE-01	Bachelor of Science (Veterinary)^ *(no new intake from 2018)*	BSc(Vet)	48
BPVETBIO-01	Bachelor of Veterinary Biology (exit only)	BVetBiol	144

**may be awarded with honours following a further year of study.*
^may be awarded with honours in an integrated program.

3 Combined degrees

Code	Course title & stream	Abbreviation	Credit points
BPCOMSCI-02	Bachelor of Commerce* and Bachelor of Science* *(no new intake from 2018)*	BCom/BSc	240
BPESMSCI-02	Bachelor of Education (Secondary: Mathematics)^ and Bachelor of Science*	BEd(Sec:Maths)/BSc	240
	Dalyell		
BPESISCI-02	Bachelor of Education (Secondary: Science)^ and Bachelor of Science*	BEd(Sec:Science)/BSc	240
	Dalyell		
BPENGMSC-01	Bachelor of Engineering^ and Bachelor of Medical Science* *(no new intake from 2018)*	BE/BMedSc	240
BPENGSCI	Bachelor of Engineering Honours^ and Bachelor of Science*	BE/BSc	240
	Dalyell		
	Health		
	Medical Science		
BPITCMSC-01	Bachelor of Information Technology^ and Bachelor of Medical Science* *(no new intake from 2018)*	BIT/BMedSc	240
BPITCSCI-01	Bachelor of Information Technology^ and Bachelor of Science* *(no new intake from 2018)*	BIT/BMedSc	240
BPSCIART-02	Bachelor of Science and Bachelor of Arts* *(no new intake from 2018)*	BSc/BA	192
BPSCILAW-02	Bachelor of Science* and Bachelor of Laws^	BSc/LLB	240
	Dalyell		
BUSCINUR-01	Bachelor of Science* and Master of Nursing	BSc/MN	192
	Dalyell		
	Health		
BPSCIAVS-01	Bachelor of Science and Bachelor of Advanced Studies	BSc/BAdvStudies	192
	Dalyell		
	Advanced		
	Health		
	Medical Science		
	Agriculture		

Code	Course title & stream	Abbreviation	Credit points
	Animal and Veterinary Bioscience		
	Food and Agribusiness		
	Master of Veterinary Studies/Master of Veterinary Clinical Studies	MVetStud/MVetClinStud	48
	Canine Medicine	MVetStud/MVetClinStud(Canine Medicine)	48
	Equine Medicine	MVetStud/MVetClinStud(Equine Medicine)	48
	Equine Surgery	MVetStud/MVetClinStud(Equine Surgery)	48
	Feline Medicine	MVetStud/MVetClinStud(Feline Medicine)	48
	Ruminant Medicine	MVetStud/MVetClinStud(Ruminent Medicine)	48
	Small Animal Cardiology	MVetStud/MVetClinStud(Small Animal Cardiology)	48
	Small Animal Medicine	MVetStud/MVetClinStud(Small Animal Medicine)	48
	Small Animal Surgery	MVetStud/MVetClinStud(Small Animal Surgery)	48
	Veterinary Anaesthesia	MVetStud/MVetClinStud(Veterinary Anaesthesia)	48
	Veterinary Dermatology	MVetStud/MVetClinStud(Veterinary Dermatology)	48
	Veterinary Diagnostic Imaging	MVetStud/MVetClinStud(Veterinary Diagnostic Imaging)	48
	Veterinary Emergency Medicine and Critical Care	MVetStud/MVetClinStud(Veterinary Emergency Medicine and Critical Care)	48
	Veterinary Pathology	MVetStud/MVetClinStud(Veterinary Pathology)	48
BPVBLVMD-01	Bachelor of Veterinary Biology/Doctor of Veterinary Medicine	BVetBiol/DVM	288
	Bachelor of Science and Bachelor of Advanced Computing	BSc/BAdvComp	240
	Health		
	Medical Science		

*may be awarded with honours following a further year of study.
^may be awarded with honours in an integrated program.

4 Double degrees

Code	Course title & stream	Abbreviation	Credit points
MACLPPHD-01 / RPPHDSCI-04	Master of Clinical Psychology and Doctor of Philosophy	MCP/PhD	96/Research
BPMSCMED-01	Bachelor of Medical Science* and Doctor of Medicine *(no new intake from 2018)*	BMedSc/MD	336
BPSCADMD-01	Bachelor of Science (Advanced)* and Doctor of Dental Medicine *(no new intake from 2018)*	BSc(Adv)/DMD	336
BSCIDMD-01	Bachelor of Science and Doctor of Dental Medicine	BSc/DMD	336
	Dalyell		
BPSCINUD-02	Bachelor of Science* and Master of Nutrition and Dietetics	BSc/MND	240
	Dalyell		
BPSCAMED-01	Bachelor of Science (Advanced)* and Doctor of Medicine *(no new intake from 2018)*	BSc(Adv)/MD	336
BPSCIMED-01	Bachelor of Science and Doctor of Medicine	BSc/MD	336
	Dalyell		
	Medical Science		

*may be awarded with honours following a further year of study.

5 Graduate diplomas

Code	Course title & stream	Abbreviation	Credit points
GNPSYCOA-01	Graduate Diploma in Coaching Psychology	GradDip(CoachPsyc)	36
GNMASCMG-02	Graduate Diploma in Marine Science and Management	GradDipMarSciMgt	48
GNENVSCI-02	Graduate Diploma in Environmental Science	GradDipEnviSci	48
GNMEDPHY-01	Graduate Diploma in Medical Physics	GradDipMedPhys	48

Code	Course title & stream	Abbreviation	Credit points
GNPSYCHO-02	Graduate Diploma in Psychology	GradDipPsych	48
GNSCIENC-01	Graduate Diploma in Science	GradDipSc	48
GNSUSTAI-01	Graduate Diploma in Sustainability	GradDipSust	48
GNAGRENV-01	Graduate Diploma in Agriculture and Environment	GradDipAgrEnv	48
GNANMSCI-01	Graduate Diploma in Animal Science *(no new intake from 2018)*	GradDipAnimSc	48
GNASCABM-01	Animal Breeding Management (available by distance online only) *(no new intake from 2018)*	GradDipAnimSc(ABMgt)	48
	Animal Genetics *(no new intake from 2018)*	GradDipAnimSc(Animal Genetics)	48
	Animal Nutrition *(no new intake from 2018)*	GradDipAnimSc(Animal Nutrition)	48
	Animal Reproduction *(no new intake from 2018)*	GradDipAnimSc(Animal Reproduction)	48
GNVETPHE-01	Graduate Diploma in Veterinary Public Health *(no new intake from 2017)*	GradDipVPH	36
GNVEPHMA-01	Graduate Diploma in Veterinary Public Health Management *(no new intake from 2018)*	GradDipVPHMgt	36
GNVETSTD-01	Graduate Diploma in Veterinary Studies *(no new intake from 2018)*	GradDipVetStud	48
	Small Animal Clinical Studies	GradDipVetStud(Small Animal Clinical Studies)	36
GNWIHEPM-02	Graduate Diploma of Wildlife Health and Population Management *(no new intake from 2018)*	GradDipMWHPMgt	48

6 Graduate certificates

Code	Course title & stream	Abbreviation	Credit points
GCPSYCOA-01	Graduate Certificate in Coaching Psychology	GradCert(CoachPsyc)	24
GCMASCMG-01	Graduate Certificate in Marine Science and Management	GradCertMarSciMgt	24
GCENVSCI-01	Graduate Certificate in Environmental Science	GradCertEnviSci	24
GCSCHIPS-01	Graduate Certificate in Science (History and Philosophy of Science)	GradCertSc(HPS)	24
GCSUSTAI-01	Graduate Certificate in Sustainability	GradCertSust	24
GCAGRENV-01	Graduate Certificate in Agriculture and Environment	GradCertAgrEnv	24
GCANMSCI-01	Graduate Certificate in Animal Science *(no new intake from 2018)*	GradCertAnimSc	24
GCASCABM-01	Animal Breeding Management (available by distance online only) *(no new intake from 2018)*	GradCertAnimSc(ABMgt)	24
	Animal Genetics *(no new intake from 2018)*	GradCertAnimSc(Animal Genetics)	24
	Animal Nutrition *(no new intake from 2018)*	GradCertAnimSc(Animal Nutrition)	24
	Animal Reproduction *(no new intake from 2018)*	GradCertAnimSc(Animal Reproduction)	24
GCVETPHE-01	Graduate Certificate in Veterinary Public Health *(no new intake from 2017)*	GradCertVPH	24
GCVEPHMA-01	Graduate Certificate in Veterinary Public Health Management *(no new intake from 2018)*	GradCertVPHMgt	24
GCVETSTD-01	Graduate Certificate in Veterinary Studies *(no new intake from 2018)*	GradCertVetStud	24
	Small Animal Clinical Studies	GradCertVetStud(Small Animal Clinical Studies)	24
GCWIHEPM-02	Graduate Certificate in Wildlife Health and Population Management *(no new intake from 2018)*	GradCertWHPMgt	24

Resolutions of the Faculty

Resolutions of the Faculty of Science for coursework awards

These resolutions apply to all undergraduate and postgraduate coursework award courses in the Faculty, unless specifically indicated otherwise. Students enrolled in postgraduate research awards should consult the resolutions for their course. These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the resolutions for the course of enrolment, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

1. Admissions

(1) The provisions of the Coursework Rule and the Coursework Policy apply to the admission of domestic and international applicants to undergraduate and postgraduate coursework courses. Course resolutions may prescribe additional admission requirements.

(2) The Faculty participates in the following approved special admission programs under the Coursework Policy:

Course	Broadway Scheme	Cadigal Program	E12 Scheme	Mature Age Applicants Scheme	Elite Athletes or Performers Scheme	Special Consideration for Admission Scheme	Future Leaders Scheme
Bachelor of Liberal Arts and Science	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bachelor of Science	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bachelor of Science and Bachelor of Advanced Studies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bachelor of Science (Advanced) and Bachelor of Advanced Studies	Yes	Yes	Yes	No	Yes	Yes	Yes
Bachelor of Science (Medical Science)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bachelor of Science (Medical Science) and Bachelor of Advanced Studies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bachelor of Science (Health)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bachelor of Science (Health) and Bachelor of Advanced Studies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bachelor of Science and Bachelor of Advanced Studies (Agriculture)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bachelor of Science and Bachelor of Advanced Studies (Food and Agribusiness)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bachelor of Science and Bachelor of Advanced Studies (Animal and Veterinary Bioscience)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bachelor of Veterinary Bioscience and Doctor of Veterinary Medicine	Yes	Yes	Yes	No	Yes	Yes	No
Bachelor of Science and Doctor of Dental Medicine	No	Yes	No	No	No	No	No
Bachelor of Science and Doctor of Medicine	No	Yes	No	No	No	No	No

Course	Broadway Scheme	Cadigal Program	E12 Scheme	Mature Age Applicants Scheme	Elite Athletes or Performers Scheme	Special Consideration for Admission Scheme	Future Leaders Scheme
Bachelor of Science (Medical Science) and Doctor of Medicine	No	Yes	No	No	No	No	No
Bachelor of Science and Master of Nutrition and Dietetics	Yes	Yes	No	No	Yes	Yes	Yes
Bachelor of Psychology	Yes	Yes	No	No	Yes	Yes	Yes
Master of Clinical Psychology	n/a	Yes	n/a	n/a	n/a	n/a	n/a
Master of Clinical Psychology and Doctor of Philosophy	n/a	Yes	n/a	n/a	n/a	n/a	n/a

2. Enrolment restrictions

(1) Except with the permission of the Associate Dean an undergraduate student may not enrol in units of study with a total value of more than 30 credit points in either semester one or two, 12 credit points in the summer session and 6 credit points in the winter session.

(2) Except with the permission of the Associate Dean a postgraduate coursework student may not enrol in units of study with a total value of more than 24 credit points in either semester one or two, 12 credit points in the summer session and 6 credit points in the winter session.

(3) Except with the permission of the Associate Dean, undergraduate students are prohibited from:

(a) re-enrolling in a unit of study that they have previously completed within the last 10 calendar years, regardless of whether the unit of study was completed in their current or previous award course; and

(b) enrolling in any unit of study:

(i) that overlaps substantially in content with a unit of study already completed in their current or previous award course within the last 10 calendar years; and/or

(ii) for which credit equivalence or exemption has been granted within the last 10 calendar years.

(4) Except with the permission of the Associate Dean, postgraduate coursework students are prohibited from:

(a) re-enrolling in a unit of study that they have previously completed within the last 5 calendar years, regardless of whether the unit of study was completed in their current or previous award course; and

(b) enrolling in any unit of study:

(i) that overlaps substantially in content with a unit of study already completed in their current or previous award course within the last 5 calendar years; and/or

(ii) for which credit equivalence or exemption has been granted within the last 5 calendar years.

3. Time Limits

The provisions of the Coursework Rule apply to the time limits for undergraduate and postgraduate programs, unless otherwise stated in the course resolutions.

4. Re-enrolment after an absence

Unless otherwise stated within the course resolutions, provisions of the Coursework Rule and the Coursework Policy apply. A student who plans to re-enrol after a period of suspension must advise the Student Centre of their intention prior to the commencement of semester. Students should pay careful attention to the significant dates in processes and their effect on results and financial liability.

5. Course Transfer

(1) Schedule 1 of the Faculty Resolutions lists the allowable Undergraduate course transfers and the conditions for transfer approved by the Faculty of Science for students who commenced their studies after 1 January 2018. Schedule 2 of the Faculty Resolutions lists the allowable Postgraduate course transfers and the conditions for transfer approved by the Faculty of Science for students who commenced their studies after 1 January 2018. For students who commenced their studies prior to 1 January 2018, please refer to the 2017 Handbook.

(2) Providing students satisfy the admission requirements for each stage of an articulated postgraduate coursework program, a student may apply to progress to the award of any of the courses within that sequence. Only the highest award completed will be conferred.

(3) A student enrolled in a postgraduate coursework masters may, with the approval of the Associate Dean, elect to discontinue study and graduate with the graduate diploma from the embedded sequence provided the requirements of the graduate diploma have been met.

(4) A student enrolled in a postgraduate coursework graduate diploma may, with the approval of the Associate Dean, elect to discontinue study and graduate with the graduate certificate from the embedded sequence provided the requirements of the graduate certificate have been met.

(5) All applications for transfer in a postgraduate coursework program must satisfy the Faculty specified time limits for application and transfer requests.

6. Credit for previous study

(1) Unless otherwise stated within the course resolutions, the provisions of the Coursework Rule and the Coursework Policy apply to the granting of credit, and in addition:

Course	Rule
Undergraduate courses	All students must complete all the 3000-level units of study required for a Science Table A major at the University of Sydney.

Course	Rule
Postgraduate courses	Credit is available in the articulated postgraduate courses for postgraduate study as long as it has been undertaken in these award courses within the previous five years. Unless otherwise stated in the course resolutions, external credit and reduced volume of learning are not available to students enrolled in postgraduate programs.
Master of Agriculture and Environment	Credit may be granted for specific core units up to a maximum of 25 percent of the requirements for the degree, but not for the elective units or research units. A reduction in volume of learning of up to 24 credit points may be available to students who have completed a qualification in an appropriate discipline at Level 8 of the Australian Qualifications Framework.
Bachelor of Veterinary Biology/Doctor of Veterinary Medicine	Credit may be granted only for specific core and elective units in Year 1 and Year 2 up to a maximum of 48 credit points. Studies must have been completed with at least a credit grade and no more than five years prior to admission.

7. Cross institutional study

(1) Provided the Associate Dean's permission has been obtained in advance, a student may be permitted to complete a unit of study offered by another institution and have that unit credited to the student's course requirements, provided that:
(a) the unit of study content is not taught in any corresponding unit of study at the University; or
(b) the student is unable, for good reason, to attend a corresponding unit of study at the University.
(2) Cross-institutional study is regarded as another form of credit.
(3) Unless otherwise stated in the course resolutions, cross-institutional study is not available to students enrolled in postgraduate programs.

8. International Study

(1) The Faculty encourages students to participate in international study, unless the resolutions for a particular course preclude this. Provided the Associate Dean's permission has been obtained a student may be permitted to count units completed overseas towards their undergraduate degree by participating in:
(a) the University of Sydney Exchange Program; or
(b) a Study Abroad program; or
(c) an International Placement
(2) For International Placements, Associate Dean approval must be given well in advance of travel for unit of study enrolment based on an agreed degree plan.
(3) Students applying for Study Abroad should refer to the Faculty of Science - Short Term Independent Undergraduate Study Abroad local provisions.

9. Attendance

(1) Unless otherwise stated in a separate local provision, students are expected to attend a minimum of 80% of timetabled activities for a unit of study, unless granted exemption by the Associate Dean.
(2) For some units of study the minimum attendance requirement, as specified in the relevant table of units or the unit of study outline, may be greater than 80%.
(3) The Associate Dean may determine that a student has failed a unit of study because of inadequate attendance.
(4) The Associate Dean may allow additional assessment items where attendance is lower than the requirement as specified in 9(1) and 9(2).

10. Results

(1) The provisions of the Coursework Rule and the Coursework Policy apply to the award of grades in Science units of study.
(2) The determination of what warrants a DC grade after the published date for Discontinued not to count as failure is made at the discretion of the Associate Dean on a documented case-by-case basis. Discretion will not be exercised where:
(a) the request is made 12 months or more after the advertised date of result publication; or
(b) where the student has passed the unit of study.

11. Satisfactory Progress

In addition to meeting the provisions of the Coursework Rule and the Coursework Policy, students must also meet all progression requirements listed in specific course resolutions.

12. Re-assessment

Re-assessment is not permitted unless otherwise specified in the course resolutions.

13. Award of the bachelor degree with honours

The following rules apply to the award of the bachelor degree with Honours unless otherwise stipulated in the relevant course resolutions.
(1) To qualify for admission to the bachelor degree with honours, an applicant must meet all of the following requirements:
(a) have either:
(i) qualified for the award of a relevant pass degree from the Faculty of Science; or
(ii) be a pass graduate of the Faculty of Science; or
(iii) be a pass graduate holding an equivalent qualification from another institution,
(b) have completed a minimum of 24 credit points of senior units of study relevant to the intended honours course (or equivalent at another institution);
(c) have achieved either:
(i) a SCIWAM of at least 65 (or equivalent at another institution); or
(ii) a credit average in 48 credit points in relevant intermediate and senior Science units of study as determined by the School concerned,
(d) satisfy any additional criteria set by the Head of School concerned.
(2) General conditions of candidature include:
(a) Students must complete the requirements for the honours course full-time over two consecutive semesters. If the School is satisfied that a student is unable to attempt the honours course on a full-time basis permission may be granted by the Associate Dean to undertake honours part-time.

(b) An applicant who is qualified to enrol in two honours courses may either:
(i) complete the honours courses in the two subject areas separately and in succession; or
(ii) complete a joint honours course, equivalent to an honours course in a single subject area, in the two subject areas as agreed by the Associate Dean and both Schools. A joint honours course shall comprise such parts of the two honours courses as may be decided by the Associate Dean.
(c) A student may not re-attempt an honours course.
(4) To qualify for the award of honours, a student must complete 48 credit points of honours undergraduate units of study, as described in the Science Honours Unit of Study Table.
(5) The grade of honours and the honours mark are determined by performance in only the units of study listed in the Science Honours Unit of Study Table.
(6) Honours is awarded in the following classes:

Description	Mark Range
Honours Class I	Mark >= 80
Honours Class II (Division 1)	75 <= Mark < 80
Honours Class II (Division 2)	70 <= Mark < 75
Honours Class III	65 <= Mark < 70
Honours not awarded	Mark < 65

14. University Medal

A student who is awarded Honours Class 1 may be awarded a university medal. The medal is awarded at the discretion of the Faculty to the highest achieving students who, in the opinion of the Faculty, have an outstanding academic record, in accordance with the Coursework Rule.

15. Weighted Average Mark (WAM) and Science Weighted Average Mark (SCIWAM)

(1) The University has a formula for calculating a WAM, which is defined in the University Glossary. WAMs are used by the University as one indicator of academic performance.
(2) A SCIWAM is used by the Faculty of Science as one indicator of academic performance.
(a) A SCIWAM is calculated from the results of all intermediate and senior units of study with a weighting of two for intermediate units and three for senior units. Junior units are not included in the calculation.
(b) Discontinued - Fail (DF) grades will contribute to the SCIWAM. The mark used for units of study with a grade of DF is zero.
(c) Discontinued - Not to count as failure (DC) grades do not contribute to the SCIWAM.
(d) Pass/Fail units of study do not contribute to the SCIWAM, with the exception of Exchange units where a mark is available.
(3) In this Faculty:
(a) A junior unit of study is a 1000-level unit.
(b) An intermediate unit of study is a 2000-level unit.
(c) A senior unit of study is a 3000-level unit or above.

16. Talented Student Program

(1) The Talented Student Program (TSP) is a special program of study for students of exceptional merit who are enrolled in undergraduate degrees administered by the Faculty of Science or for the Science component of combined and double degrees who commenced prior to January 1 2018.
(2) Entry to the TSP is by invitation from the Dean. Invitations are made each year, for that year. The following guidelines apply generally, although schools and departments may have additional (and more stringent) requirements for entry to the activities they offer in the program:
(a) To be considered for the program in their first year, students should have an ATAR (or equivalent) of 99.00 or higher.
(b) To be considered for entry into the Program in their second or third years, students not in the Program in the previous year should have AAMs of 85 or over in their previous year of study. Subsequent entry to TSP is available only to students who have been enrolled full-time in units of study totalling at least 48 credit points in the previous 12 months.
(4) Readmission to the Program in a subsequent year requires:
(a) AAM of 80 or above; and
(b) completion of 42 credit points in the previous 12 months.
(5) At the discretion of the Associate Dean, these requirements may be varied on a year to year or individual basis.

Schedule 1: Allowable Undergraduate Course Transfers

(1) **Single Undergraduate Degrees**

Transfer From	Transfer To	Requirements
Bachelor of Psychology (Arts and Social Sciences)	Bachelor of Arts	
Bachelor of Psychology (Science)	Bachelor of Science	

(2) **Combined Undergraduate Degrees**

Transfer From	Transfer To
Bachelor of Science and Bachelor of Laws	Bachelor of Arts and Bachelor of Laws
	Bachelor of Commerce and Bachelor of Laws
	Bachelor of Economics and Bachelor of Laws
	Bachelor of Engineering Honours and Bachelor of Laws

Transfer From	Transfer To
	Bachelor of Science

(3) **Double Degrees**

Transfer From	Transfer To	Requirements
Bachelor of Science and Master of Nutrition and Dietetics	Bachelor of Science	
Bachelor of Science / Doctor of Medicine	Bachelor of Science	Faculty Approval Required
Bachelor of Science and Doctor of Dental Medicine	Bachelor of Science	Faculty Approval Required

Schedule 2: Allowable Postgraduate Course Transfers

Transfer From	Transfer To	Requirements
Graduate Certificate in Coaching Psychology	Graduate Diploma in Coaching Psychology	Complete the requirements of the Graduate Certificate OR; accumulate a minimum of 18 cps in the Graduate Certificate within a maximum of two consecutive semesters with a WAM of at least 65.0.
Graduate Diploma in Coaching Psychology	Graduate Certificate in Coaching Psychology	
	Master of Science in Coaching Psychology	Complete the requirements of the Graduate Diploma OR; accumulate a minimum of 18 cps in the Graduate Diploma within a maximum of two consecutive semesters with a WAM of at least 65.0.
Master of Science in Coaching Psychology	Graduate Certificate in Coaching Psychology	
	Graduate Diploma in Coaching Psychology	
Master of Clinical Psychology and Doctor of Philosophy	Doctor of Philosophy	Course Coordinator approval required
	Master of Clinical Psychology	Course Coordinator approval required
Graduate Certificate in Environmental Science	Graduate Diploma in Environmental Science	Complete the requirements of the Graduate Certificate OR; accumulate a minimum of 18 cps in the Graduate Certificate within a maximum of two consecutive semesters with a WAM of at least 65.0.
Graduate Diploma in Environmental Science	Graduate Certificate in Environmental Science	
	Master of Environmental Science	Complete the requirements of the Graduate Diploma OR; accumulate a minimum of 18 cps in the Graduate Diploma within a maximum of two consecutive semesters with a WAM of at least 65.0.
Master of Environmental Science	Graduate Certificate in Environmental Science	
	Graduate Diploma in Environmental Science	
Graduate Certificate in Marine Science and Management	Graduate Diploma in Marine Science and Management	Complete the requirements of the Graduate Certificate OR; accumulate a minimum of 18 cps in the Graduate Certificate within a maximum of two consecutive semesters with a WAM of at least 65.0.
Graduate Diploma in Marine Science and Management	Graduate Certificate in Marine Science and Management	
	Master of Marine Science and Management	Complete the requirements of the Graduate Diploma OR; accumulate a minimum of 18 cps in the Graduate Diploma within a maximum of two consecutive semesters with a WAM of at least 65.0.
Master of Marine Science and Management	Graduate Certificate in Marine Science and Management	
	Graduate Diploma in Marine Science and Management	
Graduate Certificate in Sustainability	Graduate Diploma in Sustainability	Complete the requirements of the Graduate Certificate OR; accumulate a minimum of 18 cps in the Graduate Certificate within a maximum of two consecutive semesters with a WAM of at least 65.0.
Graduate Diploma in Sustainability	Graduate Certificate in Sustainability	
	Master of Sustainability	Complete the requirements of the Graduate Diploma OR; accumulate a minimum of 18 cps in the Graduate Diploma within a maximum of two consecutive semesters with a WAM of at least 65.0.
Master of Sustainability	Graduate Certificate in Sustainability	
	Graduate Diploma in Sustainability	
Graduate Diploma in Medical Physics	Master of Medical Physics	Complete the requirements of the Graduate Diploma with a WAM of 65.0 or better and have Course Coordinator approval.
Master of Medical Physics	Graduate Diploma in Medical Physics	Complete the Graduate Diploma requirements and have Course Coordinator approval
Graduate Certificate in Science (History and Philosophy of Science)	Graduate Diploma in Science	Course Coordinator approval required
Graduate Diploma in Agriculture and Environment	Graduate Certificate in Agriculture and Environment	Complete the degree requirements.
	Master of Agriculture and Environment	
Master of Agriculture and Environment	Graduate Certificate in Agriculture and Environment	Complete the degree requirements.
	Graduate Diploma in Agriculture and Environment	Complete the degree requirements.

Prohibited units of study

ECMT1010

No student in any degree administered by the Faculty of Science (including those degrees jointly administered by the Faculty of Science and another faculty) is permitted to undertake ECMT1010. No exception is made for any student. ECMT1010 has been deemed mutually exclusive with MATH1005, MATH1015, MATH1905 and DATA1001.

If their degree resolutions allow, students may enrol into ECMT1020 or intermediate Econometrics and Economics units of study. These units are not deemed mutually exclusive with Science Table 1 and Science Table A.

Students wishing to complete an Economics major should take one of MATH1005, MATH1015 or MATH1905 in lieu of ECMT1010.

Any BSc/BA or BLAS degree students who have completed ECMT1010 before 2013 will be made an exception. They are permitted to count ECMT1010 towards completion of their degree.

Affected students should seek degree planning advice from the Faculty of Science directly, or, for BLAS degree affected students, seek degree planning advice from the BLAS degree coordinators – Professor Fiona White (Science stream) and Dr Benjamin Miller (Arts stream).

ECON1003

No student in any degree administered by the Faculty of Science (including those degrees jointly administered by the Faculty of Science and another faculty) shall be permitted to undertake ECON1003. No exception is made for any students. ECON1003 has been deemed mutually exclusive with units in Science Table 1 and Science Table A – namely MATH1111, MATH1011, MATH1001, MATH1901, MATH1906, MATH1021, MATH1921 and MATH1931.

Students wishing to undertake ECON1003 should consider taking one of MATH1111, MATH1011, MATH1021, MATH1921 and MATH1931 instead.

Students in any degree administered by the Faculty of Science who have completed ECON1003 as part of their degree prior to 2014 shall be made an exception. They will be permitted to count ECON1003 towards completion of their degree.

BUSS1020

No student in any degree administered by the Faculty of Science (including those degrees jointly administered by the Faculty of Science and another faculty) shall be permitted to undertake BUSS1020. BUSS1020 has been deemed mutually exclusive with units in Science Table 1 and Science Table A – namely MATH1005, MATH1015, MATH1905 and DATA1001.

Table A Overview

Award requirements

Bachelor of Science

To qualify for the award of the Bachelor of Science, a candidate must complete 144 credit points, comprising:

1. 24 credit points of degree core units of study as set out in the table below
2. A major (48 credit points) or program from the table below
3. A minor (36 credit points) or second major (48 credit points) listed and specified in the table below or Table S
4. 12 credit points of units of study in the Open Learning Environment as listed in Table O
5. Where appropriate, elective units from Table A and Table S
6. If enrolled in a stream, complete the requirements for the stream as specified in the table for that stream.

Bachelor of Science / Bachelor of Advanced Studies

To qualify for the award of the Bachelor of Science / Bachelor of Advanced Studies, a candidate must complete 192 credit points, comprising:

1. 24 credit points of degree core units of study as set out in the table below
2. A major (48 credit points) or program from the table below
3. A second major (48 credit points) listed and specified in the table below or Table S
4. 12 credit points of units of study in the Open Learning Environment as listed in Table O
5. Where appropriate, elective units from Table A and Table S
6. If enrolled in a stream, complete the requirements for the stream as specified in the table for that stream.

Streams

The available streams in the Bachelor of Science are:

- Health
- Medical Science
- Dalyell.

The available streams in the Bachelor of Science / Bachelor of Advanced Studies are:

- Advanced
- Agriculture
- Animal and Veterinary Bioscience
- Food and Agribusiness
- Health
- Medical Science
- Dalyell.

In addition to the requirements specified in the degree resolutions, achievement of the Dalyell stream requires completion of 12 credit points of Dalyell units as set out in Table S.

Programs

The available programs in the Bachelor of Science are:

- Agroecosystems
- Medical Science (only available in Medical Science stream)
- Environmental Science
- Neuroscience
- Psychology
- Mathematical Science (only available in Dalyell stream).

Requirements for the Bachelor of Science programs are listed in Table A.

The available programs in the Bachelor of Science / Bachelor of Advanced Studies are:

- Agriculture (only available in Agriculture stream)
- Agroecosystems
- Food and Agribusiness (only available in Food and Agribusiness stream)
- Animal and Veterinary Bioscience (only available in Animal and Veterinary Bioscience stream)
- Medical Science (only available in Medical Science stream)
- Environmental Science
- Nanoscience and Nanotechnology

- Neuroscience
- Psychology
- Mathematical Science (only available in Dalyell stream).

Requirements for the Bachelor of Science / Bachelor of Advanced Studies programs are listed in Table A.

Majors

Table A majors are:

- Anatomy and Histology
- Animal Health, Disease and Welfare
- Animal Production
- Animal and Veterinary Bioscience (only available in Animal and Veterinary Bioscience program)
- Applied Medical Science
- Behavioural Sciences
- Biochemistry and Molecular Biology
- Biology
- Cell and Developmental Biology
- Chemistry
- Computer Science
- Data Science
- Ecology and Evolutionary Biology
- Environmental Studies
- Environmental Science (only available in Environmental Science program)
- Financial Mathematics and Statistics
- Food Science
- Genetics and Genomics
- Geography
- Geology and Geophysics
- Health (only available in Health stream)
- History and Philosophy of Science
- Human Movement (only available in Health stream)
- Immunology and Pathology
- Infectious Diseases
- Information Systems
- Marine Science
- Mathematics
- Medical Science (only available in Medical Science program)
- Medicinal Chemistry
- Microbiology
- Neuroscience
- Nutrition Science
- Pharmacology
- Physics
- Physiology
- Plant Production
- Quantitative Life Sciences
- Software Development
- Soil Science and Hydrology
- Statistics.

Minors

Table A minors are:

- Anatomy and Histology
- Animal Health, Disease and Welfare
- Animal Production
- Applied Medical Science
- Behavioural Sciences
- Biochemistry and Molecular Biology
- Biology
- Cell and Developmental Biology
- Chemistry
- Computer Science
- Data Science
- Environmental Studies
- Financial Mathematics and Statistics
- Food Science
- Genetics and Genomics
- Geography
- Geology and Geophysics
- History and Philosophy of Science
- Human Movement (only available in Health stream)
- Immunology

- Infectious Diseases
- Information Systems
- Marine Science
- Mathematics
- Medicinal Chemistry
- Microbiology
- Neuroscience
- Nutrition Science
- Pathology
- Pharmacology
- Physics
- Physiology
- Plant Production
- Plant Science
- Quantitative Life Sciences
- Software Development
- Soil Science and Hydrology
- Statistics
- Virology
- Wildlife Conservation.

Table A Degree Core units of study

The required degree core for this course is:

(i) 12 credit points of 1000-level units from any of the areas of study listed in Science Table A, excluding Mathematics units of study.
(ii) 12 credit points of 1000-level units of study listed in the table below according to the following rules:

- Students should consult relevant stream resolutions for stream-specific requirements.
- 6 credit points of calculus and 3 credit points of linear algebra and 3 credit points of statistics; or
- 6 credit points of data science and 3 credit points of calculus and 3 credit points of linear algebra.

(iii) Students cannot include units from outside Science Table A, including BUSS1020 and ECMT1010, or any other unit of study deemed mutually exclusive with units of study listed in Science Table A, in the degree core.

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
DEGREE CORE			
The required degree core for this course is:			
(i) 12 credit points of 1000-level units from any of the areas of study listed in Science Table A, excluding Mathematics units of study.			
(ii) 12 credit points of 1000-level units of study listed in the table below according to the following rules: (a) Students should consult relevant stream resolutions for stream-specific requirements. (b) 6 credit points of calculus and 3 credit points of linear algebra and 3 credit points of statistics; or (c) 6 credit points of data science and 3 credit points of calculus and 3 credit points of linear algebra.			
(iii) Students cannot include units from outside Science Table A, including BUSS1020 and ECMT1010, or any other unit of study deemed mutually exclusive with units of study listed in Science Table A, in the degree core.			
1000-level units of study			
Calculus units			
MATH1021 **Calculus Of One Variable**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931	Semester 1
MATH1921 **Calculus Of One Variable (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 *Note: Department permission required for enrolment*	Semester 1
MATH1931 **Calculus Of One Variable (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 1
MATH1023 **Multivariable Calculus and Modelling**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933	Semester 2
MATH1923 **Multivariable Calculus and Modelling (Adv)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 *Note: Department permission required for enrolment*	Semester 2
MATH1933 **Multivariable Calculus and Modelling (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 2
MATH1011 **Applications of Calculus**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1001 or MATH1901 or MATH1906 or MATH1111 or BIOM1003 or ENVX1001 or MATH1021 or MATH1921 or MATH1931	Semester 1 Summer Main
MATH1013 **Mathematical Modelling**	3	**A** HSC Mathematics or a credit or higher in MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1003 or MATH1903 or MATH1907 or MATH1023 or MATH1923 or MATH1933	Semester 2 Summer Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MATH1111 **Introduction to Calculus**	6	**A** HSC General Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1011 or MATH1901 or MATH1906 or MATH1001 or HSC Mathematics Extension 1 or HSC Mathematics Extension 2 or ENVX1001 or MATH1021 or MATH1921 or MATH1931 *Note: Department permission required for enrolment* *Students who have previously successfully studied calculus at a level at least equivalent to HSC Mathematics are prohibited.*	Semester 1
Linear algebra units			
MATH1014 **Introduction to Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1012 or MATH1002 or MATH1902	Semester 2
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1012 or MATH1014 or MATH1902	Semester 1 Summer Main
MATH1902 **Linear Algebra (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1002 or MATH1012 or MATH1014 *Note: Department permission required for enrolment*	Semester 1
Statistics units			
MATH1005 **Statistical Thinking with Data**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020	Semester 2 Summer Main Winter Main
MATH1015 **Biostatistics**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020	Semester 1
MATH1905 **Statistical Thinking with Data (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 *Note: Department permission required for enrolment*	Semester 2
Data science units			
DATA1001 **Foundations of Data Science**	6	**N** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021	Semester 1 Semester 2
Alternative units			
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
ENVX2001 **Applied Statistical Methods**	6	**P** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1

Table A Honours

Honours is available in the following areas:

- Agriculture*
- Agroecosystems*
- Anatomy and Histology
- Animal and Veterinary Bioscience*
- Animal Health, Disease and Welfare*
- Animal Production*
- Applied Medical Science
- Biochemistry and Molecular Biology
- Biology
- Cell and Developmental Biology
- Chemistry
- Computer Science^
- Data Science^
- Environmental Science*
- Environmental Studies
- Food and Agribusiness*
- Food Science*
- Genetics and Genomics
- Geography
- Geology
- Geophysics
- Health
- History and Philosophy of Science^
- Human Movement
- Immunology
- Infectious Diseases
- Information Systems^
- Mathematics (Applied)^
- Mathematics (Pure)^
- Medical Science
- Medicinal Chemistry
- Microbiology
- Nanoscience and Technology^
- Neurosciences
- Pathology
- Pharmacology
- Physics^
- Physiology
- Plant Production*
- Psychology^
- Software Development^
- Soil Science and Hydrology*
- Statistics^.

Requirements for Honours are completion of 36 credit points of project work and 12 credit points of coursework, with the exception of:

(i) areas marked * for which 24 credit points of project work and 12 credit points of coursework are required
(ii) areas marked ^ for which 24 credit points project work and 24 credit points of coursework are required

Dalyell Stream

The Dalyell stream is a targeted stream for high achievers. Students who participate in the Dalyell stream are known as the ‘Dalyell Scholars’.The Dalyell stream is named after a distinguished alumna of the University, Elsie Jean Dalyell (pronounced "Dee-el"). Elsie Jean Dalyell (1881-1948) was a distinguished medical graduate from the University of Sydney and she was also the first full-time female academic in our Faculty of Medicine. She was a pioneer resident medical officer at the Royal Prince Alfred Hospital, and following this she travelled to London on a scholarship where she served in the First World War, working as a senior clinician in a Vienna-based research team studying deficiency diseases in children. She was a leader in her field and it is in this spirit that the Dalyell Program has been developed.

Dalyell Scholars will need to maintain an AAM (annual average mark) of 75% to remain in this elite program which offers outstanding students the opportunity to engage in experiences that challenge them through a broader and deeper learning experience. The Dalyell stream will offer broad choice for talented students seeking to develop expertise beyond their discipline-specific skills with a focus on self-awareness, community contribution, leadership, innovation and creative solutions skills. The program will develop vision, adaptability, breadth of perspective, and a high level of capability in and across disciplinary and cultural boundaries.

As a Dalyell Scholar, students will have access to curricular and extra-curricular activities. These include, a three-stage mentoring program; a global mobility scholarship to assist with your global mobility experience; professional development in the form of master classes; insights from distinguished speakers; leadership development activities; and two exclusive Dalyell units (6 credit points each). In addition to these curricular and extra-curricular activities, with the permission of the Dalyell Program Director, students will have access to enrichment and accelerated units of study.

For further details regarding the Dalyell stream, please refer to the Interdisciplinary Studies Handbook.

Science Electives

Electives for students in the Bachelor of Science and Bachelor of Science/Bachelor of Advanced Studies are available in the subject areas in Table A. Students also have access to electives listed in Table S.

Other opportunities include Industry and Community project units, listed in the Interdisciplinary Studies handbook. In 2018, continuing students will have access to trial these units as electives within their degrees. For students commencing in 2018, these will be available as selectives within majors. The unit code for the Science Interdisciplinary Project unit is SCPU3001.

Table A Advanced Stream

The Advanced stream is only available in the Bachelor of Science/Bachelor of Advanced Studies.

The Advanced stream requires:

- An ATAR of 95.0
- For transfer students, a WAM of 70.0
- To remain in the stream, a WAM of 65.0 in each 48 credit point block
- Completion of a major in which a minimum of 24 credit points of advanced units of study at the 2000- and 3000-levels are taken.

Advanced units are either units designated “Adv” in the list of units for the major in Table A or units taken at a level higher level than the unit specified for the major in Table A.

For example, where Table A specifies a unit at 2000 level, a student doing a 3000-level unit in its place would be regarded as completing an advanced unit.

At the discretion of the discipline, the 24 credit points of advanced units of study can either:

- be all at the 3000-level
- 18 credit points at 3000 and 6 credit points at 2000, or
- 12 credit points at 3000 and 12 credit points at 2000

Agriculture

About the stream and embedded program

The growing demand for efficient food production and the development of new methodologies and technologies, including sensors, robotics and big data analytics means that the agriculture of the 21st century requires graduates who have the expertise to fully exploit these new and exciting approaches. Agriculture is by nature multi-disciplinary and requires breadth of knowledge in four main areas; plant production, animal production, soil science & hydrology, integrated with agribusiness.

The Agriculture program will provide students with the understanding they need to address the big challenges and opportunities facing agriculture into the future. In this program students will develop knowledge and skills to explain the role and relevance of agriculture and understand the major scientific, technological and economic drivers that support changes in agricultural practice. Students will develop strong multi-disciplinary understanding of agricultural practice and innovation, strengthened by the ability to generate, manage and analyse agriculturally derived experimental, temporal and spatial data.

Requirements for completion

A stream in Agriculture requires 120 credit points, consisting of:

(i)6 credit points of 1000-level degree core units
(ii)6 credit points of 2000-level degree core units
(iii)A 108 credit point program in Agriculture

A program in Agriculture requires 108 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level selective units
(iii)36 credit points of 4000-level core units
(iv)A 48 credit point major in Animal Production, Plant Production or Soil Science and Hydrology

First year

Stream core: ENVX1002
Program core: ENVI1003, GEOS1X01

Second year

The second year provides the breadth of knowledge in agriculture with units related to plant and animal production as well as focusing on the essential resources of soil and water. This is complimented by the development of skills in data analytics through the stream core.

Stream Core: ENVX2001

Students complete units from their chosen majors:

- AGRI2001 if completing Plant Production major;
- AVBS2006 if completing Animal Production major;
- SOIL2005 if completing Soil Science and Hydrology major.

Additionally students complete 12 credit points of program units as outlined below:

- AGRI2001 and AVBS2006 if completing Soil Science and Hydrology major;
- AGRI2001 and SOIL2005 if completing Animal production major;
- AVBS2006 and SOIL2005 if completing Plant Production major.

Third year

Students complete units from their chosen majors.

The third year provides further depth in at least one of the three majors in this stream, a choice from Plant Production, Animal Production, and Soil Science and Hydrology. In your third year you must take at least one designated project unit embedded in the major.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 24 credit points.

Honours
Requirements for Honours in the area of Agriculture: completion of 24 credit points of project work and 12 credit points of coursework.

Students can complete their second major in their fourth year of study alongside 4000-level units.

Core: AFNR4001 (6cp), AFNR4101 (12cp), AFNR4102 (12cp), AFNR4000 (6cp)

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9036 5417

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building (F07)
Eastern Avenue
The University of Sydney NSW 2006

Associate Professor Damien Field
Email: damien.field@sydney.edu.au
Phone: +61 2 8627 1138

Example pathways

Students must take a major in either Animal Production, Plant Production, or Soil Science and Hydrology.

Learning Outcomes

Students who graduate from Agriculture will be able to:

1. Explain the role and relevance of agriculture and its related sciences, and agribusiness in society.
2. Understand the major biophysical, economic, social and policy drivers that underpin agricultural practice and how they contribute to practice change.
3. Understand how information is adopted and the context within which producers, processors and consumers make decisions.
4. Understand core sciences in the context of agriculture.
5. Understand relevant agricultural production systems and their value chains, with specialist knowledge in at least one area.
6. Understand how knowledge from different sub-disciplines within agriculture is integrated and applied into practice.
7. Understand how economics, business and social science apply to agriculture.

Agriculture

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AGRICULTURE			
Agriculture stream			
The Agriculture stream is 120 credit points, consisting of: (i) 6 credit points of 1000-level degree core units (ii) 6 credit points of 2000-level degree core units (iii) A 108 credit point program in Agriculture			
Agriculture program			
This program is only available to students enrolled in Agriculture stream. A program in Agriculture requires 108 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level selective units (iii) 36 credit points of 4000-level core units (iv) A 48 credit point major in Animal Production, Plant Production or Soil Science and Hydrology			
Units of study			
The units of study are listed below.			
1000-level units of study			
Stream core			
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
Program core			
ENVI1003 **Global Challenges: Food, Water, Climate**	6		Semester 2
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
GEOS1901 **Earth, Environment and Society Advanced**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 *Note: Department permission required for enrolment*	Semester 1
2000-level units of study			
Stream core			
ENVX2001 **Applied Statistical Methods**	6	**P** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
Selective units-choose two units not in chosen major			
SOIL2005 **Soil and Water: Earth's Life Support Systems**	6	**N** SOIL2003 or LWSC2002	Semester 1
AVBS2006 to be developed for offering in 2019			
4000-level units of study			
Program core			
AFNR4001 **Professional Development**	6	**N** AGRF4000 *Note: Department permission required for enrolment*	Semester 2
AFNR4101 **Research Project A**	12	**P** 144 credit points of level 1000-3000 units of study	Semester 1
AFNR4102 **Research Project B**	12	**P** AFNR4101	Semester 2
AFNR4XXX to be developed for offering in 2020			

Agriculture

AGRICULTURE

Agriculture stream

The Agriculture stream is 120 credit points, consisting of:(i) 6 credit points of 1000-level degree core units(ii) 6 credit points of 2000-level degree core units(iii) A 108 credit point program in Agriculture

Agriculture program

This program is only available to students enrolled in Agriculture stream.A program in Agriculture requires 108 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level selective units(iii) 36 credit points of 4000-level core units(iv) A 48 credit point major in Animal Production, Plant Production or Soil Science and Hydrology

Units of study

The units of study are listed below.

1000-level units of study

Stream core

ENVX1002
Introduction to Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Thomas Bishop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour tutorial per week, one 2-hour computer practical per week **Prohibitions:** ENVX1001 **Assessment:** One exam during the exam period (50%), three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This is an introductory statistics unit for students in the agricultural, life and environmental sciences. It provides the foundation for statistics and data science skills that are needed for a career in science and for further study in applied statistics and data science. In the first portion of the unit the emphasis is on describing data using statistical and graphical summaries, and probability models. In the second part the focus is on formal hypothesis testing on experimental data using statistical tests. The final part of the unit is on finding patterns in biological and environmental data, through the use of linear and non-linear functions. In the practicals the emphasis is on applying theory to analysing real datasets using the spreadsheet package Excel and the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks
No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

Program core

ENVI1003
Global Challenges: Food, Water, Climate

Credit points: 6 **Teacher/Coordinator:** A/Prof Stephen Cattle **Session:** Semester 2 **Classes:** Two lectures per week, 2hour tutorial/computer lab per week, two-day weekend field trip **Assessment:** One 2-hour exam (50%), field trip report (15%), tutorial presentation (20%), GIS reports (15%) **Practical field work:** Computer practicals and two day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

In the 21st century the population of the world will increase both in size and its expectation in terms of food, energy and consumer demands. Against this demand we have a planet in crisis where natural resources are degraded, biodiversity is diminishing and planetary cycles related to climate are reaching points of irreversible change. Management of our precious natural resources is a balancing act between production and conservation as always, but now we have to do this against a background of potential large scale changes in climate. In this unit students will gain an understanding of the key environmental challenges of the 21st century; namely food security, climate change, water security, biodiversity protection, ecosystems services and soil security. In the second half using Australian case studies we will explore how we manage different agro-ecosystems within their physical constraints around water, climate and soil, while considering linkages with the global environmental challenges. Management now, in the past and the future will be considered, with an emphasis on food production. This unit is recommended unit for students interested in gaining a broad overview of the environmental challenges of the 21st century, both globally and within Australia.

GEOS1001
Earth, Environment and Society

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the gateway unit of study for Human Geography, Physical Geography, Environmental Studies and Geology. Its objective is to introduce the big questions relating to the origins and current state of the planet: climate change, environment, landscape formation, and the growth of the human population. During the semester you will be introduced to knowledge, theories and debates about how the world's physical and human systems operate. The first module investigates the evolution of the planet through geological time, with a focus on major Earth systems such as plate tectonics and mantle convection and their interaction with the atmosphere, hydrosphere, biosphere and human civilisations. The second module presents Earth as an evolving and dynamic planet, investigating global environmental change, addressing climate variability and human impacts on the natural environment and the rate at which these changes occur and how they have the potential to dramatically affect the way we live. Finally, the third module, focuses on human-induced challenges to Earth's future. This part of the unit critically analyses the relationships between people and their environments, with central consideration to debates on population change, resource use and the policy contexts of climate change mitigation and adaptation.

GEOS1901
Earth, Environment and Society Advanced

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1001, but will be required to carry out more challenging practical assignments.

2000-level units of study

Stream core

ENVX2001
Applied Statistical Methods

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 3-hour computer practical per week **Prerequisites:** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] **Assessment:** One exam during the exam period (50%),three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This unit builds on introductory 1st year statistics units and is targeted towards students in the agricultural, life and environmental sciences. It consists of two parts and presents, in an applied manner, the statistical methods that students need to know for further study and their future careers. In the first part the focus is on designed studies including both surveys and formal experimental designs. Students will learn how to analyse and interpret datasets collected from designs from more than than 2 treatment levels, multiple factors and different blocking designs. In the second part the focus is on finding patterns in data. In this part the students will learn to model relationships between response and predictor variables using regression, and find patterns in datasets with many variables using principal components analysis and clustering. This part provides the foundation for the analysis of big data. In the practicals the emphasis is on applying theory to analysing real datasets using the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

Selective units-choose two units not in chosen major

SOIL2005
Soil and Water: Earth's Life Support Systems

Credit points: 6 **Teacher/Coordinator:** Prof Balwant Singh **Session:** Semester 1 **Classes:** Lectures: 3 hours per week; lab: 3 hours per week for 10 weeks **Prohibitions:** SOIL2003 or LWSC2002 **Assessment:** Field excursion: attendance and creative assessment (5%), the attendance at the excursion is complusory to get any mark for this assessment task; quiz: (10%); written assignment: modelling assessment including modelling (15%); laboratory report: group oral presentation and written assignment (20%); final exam: final written exam (50%) **Practical field work:** Approximately eight hours working field at Cobbitty Farm Wk 0 (Friday, 2 March 2018) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Soil and water are the two most essential natural resources on the Earth's surface which influence all forms of terrestrial life. This unit of study is designed to introduce students to the fundamental properties and processes of soil and water that affect food security and sustain ecosystems. These properties and processes are part of the grounding principles that underpin crop and animal production, nutrient and water cycling, and environmental sustainability. You will participate in a field excursion to examine soils in a landscape to develop knowledge and understanding of soil properties, water storage, water movement and cycling of organic carbon and nutrients in relation to food production and ecosystem functioning. At the end of this unit you will be able to articulate and quantify the factors and processes that determine the composition and behaviour of soil, composition of water, soil water storage and the movement of water on the land surface. You will also be able to describe the most important properties of soil and water for food production and sustaining ecosystem functions and link this to human and climatic factors. The field excursion, report and laboratory/computer exercises have been designed to develop communication, team work and collaborative efforts.

Textbooks

Brady, N.C. and Ray R. Weil. (2007). The Nature and Properties of Soils. 14th Edition, Prentice Hall, New Jersey. White, R.E. (2006) Principles and Practice of Soil Science: the Soil as a Natural Resource. 4th ed., Blackwell Science, Oxford. Diana H. Wall, Richard D. Bardgett, Valerie Behan-Pelletier, Jeffrey E. Herrick, T. Hefin Jones, Karl Ritz, Johan Six, Donald R. Strong, and Wim H. van der Putten (Eds.) (2012). Soil Ecology and Ecosystem Services. Oxford University Press, ISBN: 9780199575923. Kutllek, M and Nielsen, D.R. (2015). Soil: The Skin of the Planet Earth, Springer, ISBN: 978-94-017-9788-7 (Print) 978-94-017-9789-4 (Online). Gordon, N. D., McMahon, T. A., Finlayson, B. L., Gippel, C. J., and Nathan, R. J. (2004) Stream Hydrology: an Introduction for Ecologists, John Wiley and Sons Inc.

AVBS2006 to be developed for offering in 2019

4000-level units of study

Program core

AFNR4001
Professional Development

Credit points: 6 **Teacher/Coordinator:** A/Prof Damien Field **Session:** Semester 2 **Classes:** Workshops over four years **Prohibitions:** AGRF4000 **Assessment:** One blog posting (10%), one on-line (multi-media) (30%) and one portfolio (60%) **Practical field work:** 40 days of professional experience, 1 week long excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit of study is designed to allow students to critically reflect on the relationship between the rural enterprise and environment and how they can contribute to the future decisions and management affecting the rural community. It is a core unit of study in 4th year for the BAgrEc, BScAgr, BLWSc, BResEc, BHortSc which requires students to complete 40 days of professional experience with the expectation that students will examine the nature of facts from their degree in this environment. A minimum of 15 days must be completed on-farm/field. The remaining days may be at the student's discretion. The unit will be counted towards 4th year, but professional experience placements will normally be undertaken throughout the degree. In the early stages of the Professional Development program students participate in Faculty excursions that have been developed so they can experience a range of activities, such as research, extension, on-farm and industry both in the rural and urban environment to complement their learning within their individual degree programs. Building on this various workshops have been developed to assist students to identify a rural environment theme or issue of their interest with the specific emphasis being placed on them reflecting on how their new understandings of their theme of interest affects their personal and professional development. To complete this unit students will present a portfolio of their theme including critical reflection on the pivotal relationships between the academic degree, rural environment, professional experience, and beliefs and values if the rural community. Through developing these pivotal relationships, students will be able to use their new understandings to support and guide the future developments in the rural enterprise and environment. By developing and presenting the portfolio and engaging in other online activities the students will enhance their skills in inquiry, information literacy and communication. In particular the autonomous development of case studies reflecting the contemporary issues in agriculture and their professional placements the students will have to consider their understandings of ethical, social and professional issues and further develop the personal and intellectual autonomy.

Note: Department permission required for enrolment

AFNR4101
Research Project A

Credit points: 12 **Teacher/Coordinator:** Prof Budiman Minasny **Session:** Semester 1 **Classes:** No formal classes, approximately 18 hours per week **Prerequisites:** 144 credit points of level 1000-3000 units of study **Assessment:** Research proposal, literature review. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to develop a student's ability to undertake a major research project in an area of specialization. The unit builds on theoretical and applied knowledge gained across most of the units of study undertaken throughout their degree program. This unit is a corequisite with AFNR4102 and each student will work with an academic supervisor in an area of specialization and develop a well defined research project to be executed. The research project is undertaken to advance the students ability to build well-developed research skills, a strong analytical capacity, and the ability to provide high quality research results demonstrating a sound grasp of the research question. Working with an academic supervisor students will develop their ability to define a research project including the producing of testable hypotheses, identifying existing knowledge from reviewing the literature and the design and execution of a research strategy towards solving the research question. Students will build on their previous research and inquiry skills through sourcing a wide range of knowledge to solve the research problem and enhance their intellectual and personal autonomy by means of the development of experimental programs. Students will improve their written and planning skills by composing a research project proposal and the writing of a comprehensive literature review.

AFNR4102
Research Project B

Credit points: 12 **Teacher/Coordinator:** Prof Budiman Minasny **Session:** Semester 2 **Classes:** No formal classes, approximately 18 hours per week **Prerequisites:** AFNR4101 **Assessment:** Oral presentation, research paper, poster. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is a continuation of the major research project initiated in AFNR4101 and continues to build on theoretical and applied knowledge gained across most of the units of study undertaken throughout their degree program. Working with their academic supervisor in the area of specialization the student will continue to pursue the defined research project towards presenting final results and conclusions. The research results are presented in a format of a research paper as submitted to a research journal. The research paper and corrected literature review is combined and presented together as a thesis. Students will continue to build their research skills, develop strong analytical capacity, demonstrate a sound grasp of the topic, and an ability to interpret results in a broad framework. Working with an academic supervisor students will develop their ability to produce results of high quality, draw reliable conclusions and identify future areas avenues of research. Students will build on their previous research and inquiry skills through sourcing a wide range of knowledge to solve the research problem and enhance their intellectual and personal autonomy by means of the managing the research program. Students will improve their communication skills through oral presentation of their research findings, the production of a poster detailing their research findings and the writing of a research paper.

AFNR4XXX to be developed for offering in 2020

Agroecosystems

About the program

The growing demand for food production and the development new technologies, including sensors, robotics and big data analytics, is placing an increasing demand on the agriculture of the 21st century. To meet this graduates are needed with expertise to exploit these new approaches.

The Agroecosystems program focuses on three multi-disciplinary areas:

- plant production
- animal production
- soil science and hydrology.

Students in this program will be provided with an overview of agroecosystems and the opportunity to develop expertise on one of the three majors.

Students will develop knowledge and skills to explain the major science behind the drivers of change in agricultural. Students will also develop strong multi-disciplinary understanding of agricultural practices and innovations strengthened by the ability to manage and analyse agriculturally derived experimental, temporal and spatial data.

Requirements for completion

A program in Agroecosystems requires 60 credit points, consisting of:

(i)12 credit points of 2000-level selective units
(ii)A 48 credit point major in Animal Production, Plant Production or Soil Science and Hydrology

First year

Students complete units that will contribute to one of the majors aligned with this program – animal production, plant production or soil science and hydrology.

Second year

The second year provides the breadth of knowledge in the science of agriculture with units related to plant and animal production as well as focusing on the essential resources of soil and water.

Students complete units that will contribute to their chosen majors:

- AGRI2001 if completing Plant Production major
- AVBS2006 if completing Animal Production major
- SOIL2005 if completing Soil Science and Hydrology major.

Additionally students complete 12 credit points of program units as outlined below:

- AGRI2001 and AVBS2006 if completing Soil Science and Hydrology major
- AGRI2001 and SOIL2005 if completing Animal production major
- AVBS2006 and SOIL2005 if completing Plant Production major.

Third year

Students complete units that will contribute to their chosen major.

The third year provides further depth in at least one of the three majors in this stream, a choice from Plant Production, Animal Production, and Soil Science and Hydrology,

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework

The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 24 credit points and 12 credit points of coursework. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Agroecosystems: completion of 24 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9036 5417

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building (F07)
Eastern Avenue
The University of Sydney NSW 2006

Associate Professor Damien Field
Email: damien.field@sydney.edu.au
Phone: +61 2 8627 1138

Example pathways

Students must take a major in either Animal Production, Plant Production, or Soil Science and Hydrology.

Learning Outcomes

Students who graduate from Agroecosystems will be able to:

1. Explain the role and relevance of agriculture and its related sciences in society.
2. Understand the major biophysical drivers that underpin agricultural practice and how they contribute to practice change.
3. Understand how information is adopted and the context within which producers, processors and consumers make decisions.
4. Understand the core sciences in the context of agriculture.
5. Understand how knowledge from different sub-disciplines within agriculture is integrated and applied into practice.

Agroecosystems

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AGROECOSYSTEMS			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Agroecosystems program			
A program in Agroecosystems requires 60 credit points from this table including: (i) 12 credit points of 2000-level selective units (ii) A 48 credit point major in Animal Production, Plant Production or Soil Science and Hydrology.			
Units of study			
The units of study are listed below.			
2000-level units of study			
Selective units-choose two units not in chosen major			
SOIL2005 **Soil and Water: Earth's Life Support Systems**	6	**N** SOIL2003 or LWSC2002	Semester 1
AVBS2006 and AGRI2001 to be developed for offering in 2019.			

Agroecosystems

AGROECOSYSTEMS

Advanced coursework and projects will be available in 2020 for students who complete this major.

Agroecosystems program

A program in Agroecosystems requires 60 credit points from this table including:(i) 12 credit points of 2000-level selective units(ii) A 48 credit point major in Animal Production, Plant Production or Soil Science and Hydrology.

Units of study

The units of study are listed below.

2000-level units of study

Selective units-choose two units not in chosen major

SOIL2005
Soil and Water: Earth's Life Support Systems

Credit points: 6 **Teacher/Coordinator:** Prof Balwant Singh **Session:** Semester 1 **Classes:** Lectures: 3 hours per week; lab: 3 hours per week for 10 weeks **Prohibitions:** SOIL2003 or LWSC2002 **Assessment:** Field excursion: attendance and creative assessment (5%), the attendance at the excursion is complusory to get any mark for this assessment task; quiz: (10%); written assignment: modelling assessment including modelling (15%); laboratory report: group oral presentation and written assignment (20%); final exam: final written exam (50%) **Practical field work:** Approximately eight hours working field at Cobbitty Farm Wk 0 (Friday, 2 March 2018) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Soil and water are the two most essential natural resources on the Earth's surface which influence all forms of terrestrial life. This unit of study is designed to introduce students to the fundamental properties and processes of soil and water that affect food security and sustain ecosystems. These properties and processes are part of the grounding principles that underpin crop and animal production, nutrient and water cycling, and environmental sustainability. You will participate in a field excursion to examine soils in a landscape to develop knowledge and understanding of soil properties, water storage, water movement and cycling of organic carbon and nutrients in relation to food production and ecosystem functioning. At the end of this unit you will be able to articulate and quantify the factors and processes that determine the composition and behaviour of soil, composition of water, soil water storage and the movement of water on the land surface. You will also be able to describe the most important properties of soil and water for food production and sustaining ecosystem functions and link this to human and climatic factors. The field excursion, report and laboratory/computer exercises have been designed to develop communication, team work and collaborative efforts.

Textbooks

Brady, N.C. and Ray R. Weil. (2007). The Nature and Properties of Soils. 14th Edition, Prentice Hall, New Jersey. White, R.E. (2006) Principles and Practice of Soil Science: the Soil as a Natural Resource. 4th ed., Blackwell Science, Oxford. Diana H. Wall, Richard D. Bardgett, Valerie Behan-Pelletier, Jeffrey E. Herrick, T. Hefin Jones, Karl Ritz, Johan Six, Donald R. Strong, and Wim H. van der Putten (Eds.) (2012). Soil Ecology and Ecosystem Services. Oxford University Press, ISBN: 9780199575923. Kutllek, M and Nielsen, D.R. (2015). Soil: The Skin of the Planet Earth, Springer, ISBN: 978-94-017-9788-7 (Print) 978-94-017-9789-4 (Online). Gordon, N. D., McMahon, T. A., Finlayson, B. L., Gippel, C. J., and Nathan, R. J. (2004) Stream Hydrology: an Introduction for Ecologists, John Wiley and Sons Inc.

AVBS2006 and AGRI2001 to be developed for offering in 2019.

Anatomy and Histology

Study in the Discipline of Anatomy and Histology is offered by the Sydney Medical School. Units of study in this major are mostly available at standard and advanced level.

The Discipline of Anatomy and Histology is an internationally recognised and respected education and research institution. The Discipline offers a range of undergraduate and postgraduate courses and carries out extensive biomedical research. Anatomy and Histology maintains a large catalogue of specimens for education and research. Research tools include a high-resolution transmission electron microscope and confocal microscope and excellent specimen preparation facilities. Other facilities include automated electrophoresis, high-pressure liquid chromatography, standard histology, immuno-cytochemistry, in-situ hybridisation and surgery.

The Discipline also houses major museums such as the JT Wilson Museum of Human Anatomy and the J.L. Shellshear Museum of Physical Anthropology and Comparative Anatomy as well as collections that are supplemented by a growing range of online learning resources.

About the major

A major in Anatomy and Histology introduces students to the detailed study of the structure and structural development of the human body from the subcellular and cellular levels through to the gross macroscopic level.

The qualitative and quantitative descriptions of structure are related to subcellular, cellular and gross physical function. Specialised study of the subcellular and cellular development and organization of body structures and systems is undertaken in units of study in histology.

Detailed study of the development and the structure and function of the musculoskeletal system, head and neck, the viscera and the brain spinal cord and peripheral nervous system are studied in units of study in anatomy.

A major in Anatomy and Histology will provide students with a thorough and broad understanding of the microscopic and macroscopic structure and function of the human body, of its development and maturation and of its normal organisation and potential for disruption and damage.

Requirements for completion

A major in Anatomy and Histology requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)24 credit points of 3000-level core units

A minor in Anatomy and Histology is available and articulates to this major.

First year

Core: BIOL1XX8 (students enrolled in Medical Science take MEDS1X01 instead) and CHEM1XX1.

The major in Anatomy and Histology begins in first year with an introduction to human biology and an introduction to chemistry, both are key foundational knowledge in understanding human structure and function.

Second year

Core: ANAT2008 (Medical Science students take MEDS2005 instead) and ANAT2X10 (students enrolled in Medical Science take MEDS2001 or MEDS2004).

The major in Anatomy and Histology continues in second year with units which focus on the cellular building blocks of the body, which begins your studies in Histology and an introduction to the structure and function of the nervous system beginning your studies in Neuroanatomy.

In these second year units we examine the structure of human cells, tissues and organ systems at the light and electron microscopic levels. The way the body is constructed from the cellular to the organ levels and how different tissue types contribute and interact are key themes of the course. We also introduce students to the characteristics and essential structure and function of the cells that comprise the central and peripheral nervous system. We explore the make-up of the individual cells, followed by an examination of the different regions of the nervous system. We also focus on the organisation of sensory and motor systems, together with aspects of higher-order functions such as memory and attention. Based on an understanding of the organization of its components, students will also be introduced to the principles of brain organization, with specific reference to the evolution of the 'higher' centres in humans.

Third year

Core for Major and Selective for Minor: ANAT3X09, ANAT3XX4, ANAT3X07 and ANAT3X08.

The major in Anatomy and Histology continues in third year with units which focus in detail on the microscopic and macroscopic structure, organisation and function of the musculoskeletal system, the head and neck region and the viscera. The detailed focus of these units builds and extends upon the second year units, integrating knowledge gained about the cellular and neural organisation of the human body

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Anatomy and Histology: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/medicine/anatomy/
E enquiries@anatomy.usyd.edu.au
T +61 2 9351 2497

Address:
Discipline of Anatomy and Histology
Anderson Stuart Building F13
University of Sydney NSW 2006

Associate Professor Kevin Keay
E keay@anatomy.usyd.edu.au
T +61 2 9351 4132

Learning Outcomes

Students who graduate from Anatomy and Histology will be able to:

1. Demonstrate a deep and comprehensive understanding of the fundamental organization and development of the human body from its gross structure to the cellular and intracellular levels.
2. Demonstrate a deep understanding the fundamental functional properties of the body as it relates to structural properties and developmental processes.
3. Relate and apply knowledge of the structural organization and functional properties of the body to other biomedical and biological disciplines.
4. Understand the relationship(s) of anatomical and histological knowledge, with the knowledge of biological, anthropological and clinical disciplines.
5. Search, identify, discuss and evaluate the primary scientific literature in the field of the anatomical sciences, histology, cell biology and neurobiology.
6. Specify hypotheses, design research plans and specify experiments that address and test hypotheses.
7. Understand the range of histological and anatomical methodologies.
8. Appreciate the significance of histological and anatomical investigations that identify the origins of the scientific disciplines.
9. Demonstrate a thorough knowledge of the investigative and experimental approaches of the present, including state-of-the-art techniques.

Anatomy and Histology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ANATOMY AND HISTOLOGY			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Anatomy and Histology major			
A major in Anatomy and Histology requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 24 credit points of 3000-level core units			
Anatomy and Histology minor			
A minor in Anatomy and Histology minor requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
2000-level units of study			
Core			
ANAT2008 **Principles of Histology**	6	**A** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
ANAT2010 **Concepts of Neuroanatomy**	6	**A** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **N** ANAT2910 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 2
ANAT2910 **Concepts in Neuroanatomy Adv**	6	**A** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **P** Annual average mark of at least 70 in previous year **N** ANAT2010 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *Note: Department permission required for enrolment*	Semester 2
MEDS2001, MEDS2004 and MEDS2005 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Major core			
ANAT3004 **Cranial and Cervical Anatomy**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **N** ANAT3904 or ANAT3994 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3904 **Cranial and Cervical Anatomy (Advanced)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **N** ANAT3004or ANAT3994 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3994 **Cranial and Cervical Anatomy (SSP)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01; demonstrated evidence of manual dexterity and ethical approach **P** A mark of 75 or above in ANAT3907 **N** ANAT3904 or ANAT3004 *Note: Department permission required for enrolment* *Department permission required for enrolment. Course is subject to availability of donor material for dissection.Course is by invitation ONLY.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3007 **Visceral Anatomy**	6	**A** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **N** ANAT3907 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
ANAT3907 **Visceral Anatomy (Advanced)**	6	**A** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** An annual average mark of 70 or above in previous year **N** ANAT3007 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *Note: Department permission required for enrolment* *DEPARTMENTAL PERMISSION REQUIRED*	Semester 1
ANAT3008 **Musculoskeletal Anatomy**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **N** ANAT3908 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3908 **Musculoskeletal Anatomy (Advanced)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **N** ANAT3008 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
Minor selective			
ANAT3004 **Cranial and Cervical Anatomy**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **N** ANAT3904 or ANAT3994 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3904 **Cranial and Cervical Anatomy (Advanced)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **N** ANAT3004or ANAT3994 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ANAT3994 **Cranial and Cervical Anatomy (SSP)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01; demonstrated evidence of manual dexterity and ethical approach **P** A mark of 75 or above in ANAT3907 **N** ANAT3904 or ANAT3004 *Note: Department permission required for enrolment* *Department permission required for enrolment. Course is subject to availability of donor material for dissection.Course is by invitation ONLY.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3007 **Visceral Anatomy**	6	**A** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **N** ANAT3907 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
ANAT3907 **Visceral Anatomy (Advanced)**	6	**A** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** An annual average mark of 70 or above in previous year **N** ANAT3007 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *Note: Department permission required for enrolment* *DEPARTMENTAL PERMISSION REQUIRED*	Semester 1
ANAT3008 **Musculoskeletal Anatomy**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **N** ANAT3908 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3908 **Musculoskeletal Anatomy (Advanced)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **N** ANAT3008 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3X09 to be developed for offering in 2019			

Anatomy and Histology

ANATOMY AND HISTOLOGY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Anatomy and Histology major

A major in Anatomy and Histology requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 24 credit points of 3000-level core units

Anatomy and Histology minor

A minor in Anatomy and Histology minor requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 12 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry.

You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks

TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks

TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Core

ANAT2008
Principles of Histology

Credit points: 6 **Teacher/Coordinator:** Dr Laura Lindsay, Dr Samson Dowland **Session:** Semester 1 **Classes:** Two 1-hour lectures **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **Assessment:** One 1-hour theory exam,one 1-hour practical exam, mid-semester exam, theory and practical quizzes (100%) **Practical field work:** One 2-hour practical per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers the principles of cell biology and study of the structure of cells, tissues and organ systems at the light and electron microscopic levels. The focus is on human systems. Modern practical applications of histological techniques and analysis for research are also presented.

Textbooks

Paulina, W. Histology - A Text and Atlas. 7th Edition, Lippincott Williams and Wilkins. 2015.

ANAT2010
Concepts of Neuroanatomy

Credit points: 6 **Teacher/Coordinator:** Dr Karen Cullen **Session:** Semester 2 **Classes:** two 1-hour lectures per week **Prohibitions:** ANAT2910 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **Assessment:** One theory exam, one practical exam, one mid-semester in-class quiz, periodic online quizzes and written poster presentation **Practical field work:** Tutorials: One 2-hour practical tutorial in 5 sessions during semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students are introduced to the structure and organisation of the central and peripheral nervous system. The course begins with an exploration into the make-up of the individual cells, followed by an examination of the different regions of the nervous system. A final theme of the course touches on the organisation of sensory, motor and integrative systems, together with aspects of higher-order function such as memory and language. The subject covers general concepts of organisation, structure and function of the brain. Tutorial meetings will provide the opportunity to encounter topics in functional anatomy and histology of the brain using photographs, diagrams, models, animations and problem-solving. Topics in identification of central nervous system structure in typical magnetic resonance images will assist in reinforcing the theory of functional anatomy in a format students are likely to encounter in further study and in real-world situations and readings. This course will be of considerable interest to students studying anatomy and related disciplines, as well as those wishing to pursue further study in Neuroscience at senior levels.

Textbooks

Bear, MF, Connors, BW, Paradiso, MA. Neuroscience: Exploring the Brain. 3rd edition. Williams and Wilkins. 2006. Also recommended: Nolte J, Angevine JJB. The Human Brain in Photographs and Diagrams. Mosby/Elsevier. 2007.

ANAT2910
Concepts in Neuroanatomy Adv

Credit points: 6 **Teacher/Coordinator:** Dr Karen Cullen **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 1 x 1hr tutorial **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** ANAT2010 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **Assessment:** one 2-hour theory exam, one 45 min practical exam, one 1200 word critical scientific review article, one mid-semester quiz, three short online quiz-style assignments **Practical field work:** 1 x 1 hr practical **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Students are introduced to the structure and organisation of the central and peripheral nervous system. The course begins with an exploration into the make-up of the individual cells, followed by an examination of the different regions of the nervous system. A final theme of the course touches on the organisation of various systems (sensory and motor), together with aspects of higher-order function such as memory and language. In essence, the subject covers general concepts of organisation, structure and function of the brain. The laboratory practical sessions offer students the special privilege to examine human specimens in the Anatomy labs and museum. Tutorial meetings will provide the opportunity to encounter topics in functional anatomy and histology of the brain using photographs, diagrams, models, animations and problem-solving. Topics in identification of central nervous system structure in typical magnetic resonance images will assist in reinforcing the theory of functional anatomy in a format students are likely to encounter in further study and in real-world situations and readings. This course will be of considerable interest to students studying anatomy and related disciplines, as well as those wishing to pursue further study in Neuroscience at senior levels.

Textbooks

Required text: Bear, M.F., B.W. Connors, M.A. Paradiso. Neuroscience. Exploring the Brain (4th edition) Wolters Kluwer, 2016. Recommended Atlas: Nolte and Angevine. The human brain in photographs and diagrams. 4th edition Philadelphia: Elsevier/Saunders, 2013.

MEDS2001, MEDS2004 and MEDS2005 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Major core

ANAT3004
Cranial and Cervical Anatomy

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two 1-hour lectures and two 2-hour tutorials per week **Prerequisites:** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **Prohibitions:** ANAT3904 or ANAT3994 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) (100%) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and CT scans and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Color Atlas of Human Anatomy.

ANAT3904
Cranial and Cervical Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two lectures per week, two hour tutorials per week. **Prerequisites:** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **Prohibitions:** ANAT3004or ANAT3994 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy plus further studies of medical images, anatomical features not covered in the mainstream course and details of development of selected head and neck structures. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy. Also further studies of anatomical features not covered in the mainstream course and of details of development of selected head and neck structures.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Colour Atlas of Human Anatomy.

ANAT3994
Cranial and Cervical Anatomy (SSP)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two lectures per week, one two hour tutorials per week plus three hours dissection per week **Prerequisites:** A mark of 75 or above in ANAT3907 **Prohibitions:** ANAT3904 or ANAT3004 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01; demonstrated evidence of manual dexterity and ethical approach **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester), continuous assessment tasks in dissection **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, plus 3 hours dissection per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Course is subject to availability of donor material for dissection.Course is by invitation ONLY.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. Dissection activities further the understanding of the anatomy of the head and neck and develop highly advanced skills in dissection and prosection of cadaveric materials.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Colour Atlas of Human Anatomy.

ANAT3007
Visceral Anatomy

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 1 **Classes:** Two 1-hour lectures and two 2-hour tutorials per week. **Prohibitions:** ANAT3907 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) (100%) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to provide an understanding of the anatomy of the viscera of the thorax, abdomen and pelvis. Structures covered include the heart and associated great vessels, lungs, mediastinum and the abdominal viscera, the alimentary organs and the genitourinary system. The structure of anterior thoracic and abdominal walls and pelvis along with the nerve supply to the viscera and relevant endocrine structures is also covered. Emphasis is placed on the relationship of structure to function especially with respect to the important functions of breathing, digestion, excretion and reproduction. Students will be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy.

Textbooks

Rohan, Yokochi and Lutjen-drecoll. Color Atlas of Human Anatomy.

ANAT3907
Visceral Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 1 **Classes:** 2 x 1 hr lectures, 2 x 2 hr tutorials **Prerequisites:** An annual average mark of 70 or above in previous year **Prohibitions:** ANAT3007 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** theory exam, prac exam, continuous assessment (6 quizzes done at intervals during Semester) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy plus further studies of medical images, anatomical features not covered in the mainstream course and details of development of selected head and neck structures. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: DEPARTMENTAL PERMISSION REQUIRED

This unit of study aims to provide an understanding of the anatomy of the viscera of the thorax, abdomen and pelvis. Structures covered include the heart and associated great vessels, lungs, mediastinum and the abdominal viscera, the alimentary organs and the genitourinary system. The structure of anterior thoracic and abdominal walls and pelvis along with the nerve supply to the viscera and relevant endocrine structures is also covered. Emphasis is placed on the relationship of structure to function especially with respect to the important functions of breathing, digestion, excretion and reproduction. Students will be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy. Also further studies of anatomical features not covered in the mainstream course and of details of development of selected head and neck structures.

Textbooks

Rohan, Yokochi and Lutjen-drecoll. Color Atlas of Human Anatomy

ANAT3008
Musculoskeletal Anatomy

Credit points: 6 **Teacher/Coordinator:** Dr Richard Ward **Session:** Semester 2 **Classes:** Two 1-hour lectures, two 2-hour tutorials per week **Prerequisites:** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **Prohibitions:** ANAT3908 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 90 minute paper (70%), one 60 minute paper (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The unit provides an opportunity for students to study the topographical and systems anatomy of the upper limb, lower limb and the back regions. Emphasis is placed upon the identification and description of structures and the correlation of structure with function. This includes for the upper limb, its role in manipulation, for the lower limb standing and walking and for the back flexible support and protection. Emphasis is also given to the innervation of the limbs. The unit also aims to develop the general skills of observation, description, drawing, writing and discussion as applying to biological structure.

ANAT3908
Musculoskeletal Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Richard Ward **Session:** Semester 2 **Classes:** 2 x 1hr lectures **Prerequisites:** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **Prohibitions:** ANAT3008 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 90 minute paper(70%), one practical examination (30%) **Practical field work:** 2 x 2hr Anatomy Wetlab Laboratories **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide an opportunity for students to study the topographical and systems anatomy of the upper limb, lower limb and the back regions. Emphasis is placed upon the identification and description of structures and the correlation of structure with function, which for the upper limb includes its role in manipulation, for the lower limb standing and walking and for the back flexible support and protection. Emphasis is also given to the innervation of the limbs and the consequences of nerve lesions for limb function. The unit also aims to develop the general skills of observation, description, drawing, writing and discussion as applying to biological structure. The unit builds upon or compliments other macroscopic anatomy units offered by the Department and provides for the development of skills, which could be relevant to a later honours project or higher degree in the field of structural biology.

Minor selective

ANAT3004
Cranial and Cervical Anatomy

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two 1-hour lectures and two 2-hour tutorials per week **Prerequisites:** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **Prohibitions:** ANAT3904 or ANAT3994 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) (100%) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and CT scans and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Color Atlas of Human Anatomy.

ANAT3904
Cranial and Cervical Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two lectures per week, two hour tutorials per week. **Prerequisites:** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **Prohibitions:** ANAT3004or ANAT3994 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy plus further studies of medical images, anatomical features not covered in the mainstream course and details of development of selected head and neck structures. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy. Also further studies of anatomical features not covered in the mainstream course and of details of development of selected head and neck structures.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Colour Atlas of Human Anatomy.

ANAT3994
Cranial and Cervical Anatomy (SSP)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two lectures per week, one two hour tutorials per week plus three hours dissection per week **Prerequisites:** A mark of 75 or above in ANAT3907 **Prohibitions:** ANAT3904 or ANAT3004 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01; demonstrated evidence of manual dexterity and ethical approach **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester), continuous assessment tasks in dissection **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, plus 3 hours dissection per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Course is subject to availability of donor material for dissection.Course is by invitation ONLY.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. Dissection activities further the understanding of the anatomy of the head and neck and develop highly advanced skills in dissection and prosection of cadaveric materials.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Colour Atlas of Human Anatomy.

ANAT3007
Visceral Anatomy

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 1 **Classes:** Two 1-hour lectures and two 2-hour tutorials per week. **Prohibitions:** ANAT3907 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) (100%) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to provide an understanding of the anatomy of the viscera of the thorax, abdomen and pelvis. Structures covered include the heart and associated great vessels, lungs, mediastinum and the abdominal viscera, the alimentary organs and the genitourinary system. The structure of anterior thoracic and abdominal walls and pelvis along with the nerve supply to the viscera and relevant endocrine structures is also covered. Emphasis is placed on the relationship of structure to function especially with respect to the important functions of breathing, digestion, excretion and reproduction. Students will be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy.

Textbooks

Rohan, Yokochi and Lutjen-drecoll. Color Atlas of Human Anatomy.

ANAT3907
Visceral Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 1 **Classes:** 2 x 1 hr lectures, 2 x 2 hr tutorials **Prerequisites:** An annual average mark of 70 or above in previous year **Prohibitions:** ANAT3007 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** theory exam, prac exam, continuous assessment (6 quizzes done at intervals during Semester) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy plus further studies of medical images, anatomical features not covered in the mainstream course and details of development of selected head and neck structures. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: DEPARTMENTAL PERMISSION REQUIRED

This unit of study aims to provide an understanding of the anatomy of the viscera of the thorax, abdomen and pelvis. Structures covered include the heart and associated great vessels, lungs, mediastinum and the abdominal viscera, the alimentary organs and the genitourinary system. The structure of anterior thoracic and abdominal walls and pelvis along with the nerve supply to the viscera and relevant endocrine structures is also covered. Emphasis is placed on the relationship of structure to function especially with respect to the important functions of breathing, digestion, excretion and reproduction. Students will be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy. Also further studies of anatomical features not covered in the mainstream course and of details of development of selected head and neck structures.

Textbooks

Rohan, Yokochi and Lutjen-drecoll. Color Atlas of Human Anatomy

ANAT3008
Musculoskeletal Anatomy

Credit points: 6 **Teacher/Coordinator:** Dr Richard Ward **Session:** Semester 2 **Classes:** Two 1-hour lectures, two 2-hour tutorials per week **Prerequisites:** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **Prohibitions:** ANAT3908 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 90 minute paper (70%), one 60 minute paper (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The unit provides an opportunity for students to study the topographical and systems anatomy of the upper limb, lower limb and the back regions. Emphasis is placed upon the identification and description of structures and the correlation of structure with function. This includes for the upper limb, its role in manipulation, for the lower limb standing and walking and for the back flexible support and protection. Emphasis is also given to the innervation of the limbs. The unit also aims to develop the general skills of observation, description, drawing, writing and discussion as applying to biological structure.

ANAT3908
Musculoskeletal Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Richard Ward **Session:** Semester 2 **Classes:** 2 x 1hr lectures **Prerequisites:** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **Prohibitions:** ANAT3008 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 90 minute paper(70%), one practical examination (30%) **Practical field work:** 2 x 2hr Anatomy Wetlab Laboratories **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide an opportunity for students to study the topographical and systems anatomy of the upper limb, lower limb and the back regions. Emphasis is placed upon the identification and description of structures and the correlation of structure with function, which for the upper limb includes its role in manipulation, for the lower limb standing and walking and for the back flexible support and protection. Emphasis is also given to the innervation of the limbs and the consequences of nerve lesions for limb function. The unit also aims to develop the general skills of observation, description, drawing, writing and discussion as applying to biological structure. The unit builds upon or compliments other macroscopic anatomy units offered by the Department and provides for the development of skills, which could be relevant to a later honours project or higher degree in the field of structural biology.

ANAT3X09 to be developed for offering in 2019

Animal Disease, Health and Welfare

About the major

Animals play a significant role in the lives of people and communities, particularly in the areas of food, fibre production and as pets for companionship.

This Animal Health, Disease and Welfare major will integrate the areas of animal biology and ecology with comparative and veterinary science. You will learn about the science that underpins the biology of animal health and disease, including physiology, molecular biology, infectious agents and animal welfare.

An emphasis of this major is how to prevent, treat and understand disease in production and companion animals and wildlife. Your study could lead to a career in animal health sciences, including areas of infectious disease control, disease surveillance, animal welfare and animal production industries.

Requirements for completion

A major in Animal Health, Disease and Welfare requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)6 credit points of 2000-level core units
(iii)6 credit points of 2000-level selective units
(iv)24 credit points of 3000-level core units

A minor in Animal Health, Disease and Welfare is available and articulates to this major.

First year

Core: BIOL1XX6, BIOL1XX7

Second year

AVBS2001 and 6cp from: MICR2X22, IMMU2101, MICR2X31, IMMU2011, MIMI2X02 (Medical science students also have the option of MEDS2004)

Students entering the second year of the Animal Health, Disease and Welfare major will explore the principles of microbiology or immunology. They will then experience how these principles interact in the animal to influence health, disease and impact upon welfare through the core unit of study. The interaction between the host (or the animal), the agent of disease (genetics, physical, chemical and infectious agents) and environmental factors is explored. The disease and health states will be examined in this unit, through understanding how the host responds to the aetiological agent of disease and the environment through one of the basic five pathological processes that occur in tissues. These include inflammation and repair, degeneration and necrosis, circulatory disturbances, tissue deposits and pigments, and disorders of growth. Aspects covered in foundation microbiology and immunology units will be illustrated through case-based approaches used to teach the principles of pathological processes.

Third year

Core for Major: AVBS3001, AVBS3002, ANSC3106, and AVBS3000.

In third year students develop a detailed understanding of diseases impacting on animals, how we can influence disease risk through both pharmacological, ecological and welfare means in a variety of circumstances and importantly, how disease can be investigated such that causation of disease can be established.

Students will also gain techniques and broader skills through interdisciplinary project units, where they will explore key topics or explore new techniques so that new information that can be gained can potentially be utilised by the local animal carer through to farmers and government to optimise animal health and wellbeing and aid in the control, prevention and treatment of disease impacting both domesticated and wild animals.

Students will also gain a more detailed appreciation of how health and welfare issues of the animals in our care and environment can reflect on societal wellbeing (i.e. planetary health).

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000 level, including a project unit of study worth at least 12 credit points.

Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Animal Health, Disease and Welfare: completion of 24 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9036 5417

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building (F07)
Eastern Avenue
The University of Sydney NSW 2006

Dr Gary Muscatello
Email: gary.muscatello@sydney.edu.au
Phone: +61 2 9114 0790

Example pathways

Those with a strong interest in **Microbiology** should choose these units at 2000-level: AVBS2001 and MICR2X31.

Those with a strong interest in **Immunology** should choose these units at 2000-level: AVBS2001 and IMMU2011.

Learning Outcomes

Students who graduate from Animal Disease, Health and Welfare will:

1. Understand the function of eukaryotic cells and an application of this knowledge in areas of diagnostics and screening for disease and traits in animals.
2. Understand the socio-economic importance of animals in various natural and manmade environments.
3. Handle animal derived samples in a safe manner.
4. Understand animal body systems, specifically maintenance of homeostasis and the animals' response to environmental factors and stressors.
5. Understand animal pathobiology through understanding a range of disease processes and be able to distinguished disease from healthy status.
6. Apply knowledge of modern molecular techniques used in screening of health and disease status in both domesticated and non-domesticated animals.
7. Appreciate the ethical issues and practical welfare concerns related to the testing for animal disease and investigations that explore and research animal health topics.

Animal Disease, Health and Welfare

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ANIMAL HEALTH, DISEASE AND WELFARE			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Animal Health, Disease and Welfare major			
A major in Animal Health, Disease and Welfare requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 6 credit points of 2000-level core units (iii) 6 credit points of 2000-level selective units (iv) 24 credit points of 3000-level core units			
Animal Health, Disease and Welfare minor			
A minor in Animal Health, Disease and Welfare requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 6 credit points of 2000-level core units (iii) 6 credit points of 2000-level selective units (iv) 6 credit points of 3000-level core units (v) 6 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
AVBS2001 **Introductory Veterinary Pathogenesis**	6	**A** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **P** 6cp of BIOL1XXX or MBLG1XX1	Semester 2
Selective			
MICR2022 **Microbes in Society**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **N** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
MICR2922 **Microbes in Society (Advanced)**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
MICR2031 **Microbiology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **N** MICR2021 or MICR2921 or MICR2024 or MICR2931	Semester 1
MICR2931 **Microbiology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **P** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2021 or MICR2921 or MICR2024 or MICR2031	Semester 1
MEDS2004, IMMU2X11 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Major core			
AVBS3001 **Agents of Disease**	6	**A** Animal and Veterinary Bioscience years 1-2 **P** AVBS2001	Semester 1
AVBS3002 **Laboratory Disease Investigation**	6	**A** CHEM1XXX and BIOL1XXX and ANSC3103 and ANSC3104 and (ENVX2001 or BIOM2001) **P** 12cp from (MICR2X31 or IMMU2101 or AVBS2001 or AVBS3001)	Semester 2
ANSC3106 **Animal Behaviour and Welfare Science 3**	6	**P** AVBS1002	Semester 2
AVBS3XXX to be developed for offering in 2019.			
Minor core			
AVBS3001 **Agents of Disease**	6	**A** Animal and Veterinary Bioscience years 1-2 **P** AVBS2001	Semester 1
Minor selective			
AVBS3002 **Laboratory Disease Investigation**	6	**A** CHEM1XXX and BIOL1XXX and ANSC3103 and ANSC3104 and (ENVX2001 or BIOM2001) **P** 12cp from (MICR2X31 or IMMU2101 or AVBS2001 or AVBS3001)	Semester 2
ANSC3106 **Animal Behaviour and Welfare Science 3**	6	**P** AVBS1002	Semester 2
AVBS3XXX to be developed for offering in 2019.			

Animal Disease, Health and Welfare

ANIMAL HEALTH, DISEASE AND WELFARE

Advanced coursework and projects will be available in 2020 for students who complete this major.

Animal Health, Disease and Welfare major

A major in Animal Health, Disease and Welfare requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 6 credit points of 2000-level core units(iii) 6 credit points of 2000-level selective units(iv) 24 credit points of 3000-level core units

Animal Health, Disease and Welfare minor

A minor in Animal Health, Disease and Welfare requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 6 credit points of 2000-level core units(iii) 6 credit points of 2000-level selective units(iv) 6 credit points of 3000-level core units(v) 6 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

2000-level units of study

Core

AVBS2001
Introductory Veterinary Pathogenesis

Credit points: 6 **Teacher/Coordinator:** A/Prof Damien Higgins **Session:** Semester 2 **Classes:** 6 hours per week (lectures and practicals) **Prerequisites:** 6cp of BIOL1XXX or MBLG1XX1 **Assumed knowledge:** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **Assessment:** Practical class exercises (15%), mid-semester exam (20%), practical exam (15%), written exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The overarching theme for this unit of study is the concept of the interaction between the host (or the animal), the agent of disease (genetics, physical, chemical and infectious agents) and environmental factors. In disease states, the host responds to the aetiological agent of disease and the environment through one of the basic five pathological processes that occur in tissues. These include inflammation and repair, degeneration and necrosis, circulatory disturbances, tissue deposits and pigments, and disorders of growth. A case based approach will be used whenever possible to illustrate these principles and enable the student to develop a problem solving approach and the skills of critical thinking.

Textbooks
McGavin, MD and Zachary JF 2007, Pathologic Basis of Disease 4th ed., Mosby
Playfair JHL and Chain BM 2009, Immunology at a Glance. 9th ed. Wiley-Blackwell, ISBN 978-1-4051-8052-8
Tizard, Ian R 2009, Veterinary Immunology: an introduction. 8th ed. Saunders Elsevier St Louis, Mosby

Selective

MICR2022
Microbes in Society

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials per semester. Eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **Prohibitions:** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, two assignments, one quiz, one practical exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

Pathogenic microbes cause infectious diseases of humans, animals and plants, and inflict enormous suffering and economic losses.

Beneficial microbes are important contributors to food production, agriculture, biotechnology, and environmental processes. The aims of MICR2022/2922 are to explore the impacts and applications of microbes in human society and in the environment at large, and to teach skills and specialist knowledge in several key areas of microbiology. Medical Microbiology lectures will cover bacterial, viral, and fungal pathogens, and will introduce the concepts of epidemiology, transmission, pathogenicity, virulence factors, host/parasite relationships, host defences, prevention of disease, and antibiotic types, functions, and resistance. Lecture topics in other areas include Food (preservation, spoilage, poisoning, industrial context), Industrial (fermentation, traditional and recombinant products, bioprospecting), Environmental (nutrient cycles, atmosphere, wastewater, pollution, biodegradation) and Agricultural (nitrogen fixation, plant pathogens, biocontrol) microbiology. The laboratory sessions are integrated with the lecture series and are designed to give students practical experience in isolating, identifying and manipulating live potentially pathogenic microorganisms.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

MICR2922
Microbes in Society (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials, three 1-hour seminars and eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, one assignment, one quiz, one practical exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

This unit of study is based on MICR2022. A science communication exercise is unique to MICR2922 and consists of three small group sessions exploring how recent advances in microbiology are communicated to the wider public. This advanced component replaces one assignment exercise from the practical class and is assessed as short essay. The content and nature of this component is based on recent publications with potential high impact for society.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1 **Assessment:** Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks

Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

MICR2031
Microbiology

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2931 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45-minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: one written assignment (15%), one group oral presentation (10%) and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the earth's trees. This unit of study will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require if you specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology or science education.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

MICR2931
Microbiology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prerequisites:** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2031 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45 minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: two written assignments (10%, 15%), and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the Earth's trees. In this unit of study you will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Detailed aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require to specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology, or science education. As an Advanced unit, MICR2931 provides increased challenge and academic rigour to develop a greater understanding and depth of disciplinary expertise. You will actively participate in a series of small group tutorials investigating the molecular detail of microbial communication and function, which will culminate in you creating a scientific research report that communicates your understanding of recent research in microbiology.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

MEDS2004, IMMU2X11 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Major core

AVBS3001
Agents of Disease

Credit points: 6 **Teacher/Coordinator:** Dr Gary Muscatello **Session:** Semester 1 **Classes:** lectures 3 hours per week, laboratories/tutorials 2 hours per week, group work 1 hour per week **Prerequisites:** AVBS2001 **Assumed knowledge:** Animal and Veterinary Bioscience years 1-2 **Assessment:** 1500wd individual review (25%), 1000wd scenario-based group assignment (15%), 2 hour exam (50%), MCQ (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to examine and appreciate the diversity of various disease causing agents (microbiological and parasitological) of significance to animal industries and the various strategies employed by those agents in the host-pathogen-environment interaction. This study is based on an understanding of the physical, chemical and genetic characteristics of infectious agents of disease and builds on the pathological and immunological processes taught in AVBS2001 Introductory Veterinary Pathogenesis. A scenario/case based approach will be used whenever possible to enable the students to develop problem solving approaches and skills in critical thinking. Cases selected will be those that best illustrate particular concepts and/or are of particular significance to the animal/veterinary industry. Research and industry focus activities will infuse the subject content and student learning outcomes of this unit. This unit is located at the Camperdown campus.

Textbooks

A Unit of Study outline and LMS will contain detailed information and notes for this unit.
Recommended textbooks: Quinn PJ, Markey BK, Carter ME, Donnelly WJ and Leonard FC, 2011, Veterinary Microbiology and Microbial Disease. Blackwell Science, Oxford
Songer JG and Post KW, 2005, Veterinary Microbiology: Bacterial and Fungal Agents of Animal Disease. Saunders, St Louis
Hirsh DC, MacLachlan NJ and Walker RL, 2004, Veterinary Microbiology, Blackwell Science, Oxford

AVBS3002
Laboratory Disease Investigation

Credit points: 6 **Teacher/Coordinator:** A/Prof Jan Slapeta **Session:** Semester 2 **Classes:** Lectures 2 hours per week, laboratories/tutorials 4 hours per week (note these will vary depending upon the week) **Prerequisites:** 12cp from (MICR2X31 or IMMU2101 or AVBS2001 or AVBS3001) **Assumed knowledge:** CHEM1XXX and BIOL1XXX and ANSC3103 and ANSC3104 and (ENVX2001 or BIOM2001) **Assessment:** Assignments (60%), quiz (15%), theory exam (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to develop an investigative approach and familiarity with laboratory techniques, ethics and safety in preparation for honours or postgraduate training in disease research or disease investigation. Students will work through actual disease research or investigation scenarios via directed and self-directed, individual and group tasks.

Textbooks

There is no set text for this unit. Students will use primary literature and source various library texts as required for their investigations.

ANSC3106
Animal Behaviour and Welfare Science 3

Credit points: 6 **Teacher/Coordinator:** Dr Greg Cronin **Session:** Semester 2 **Classes:** 6 hours per week (including lectures, demonstrations, discussions and practical activities); classes will be held at the Camden campus **Prerequisites:** AVBS1002 **Assessment:** Assignments/presentations (50%), theory exam (50%) **Practical field work:** Practical class activities will be held at the May Farm pig unit and Camden poultry research unit, and there will be a full day excursion to Symbio Wildlife Zoo **Mode of delivery:** Normal (lecture/lab/tutorial) day

In Animal Behaviour and Welfare Science 3, the behavioural and physiological responses of mammals, birds and fish to stressors related to husbandry, housing, transport and slaughter are explored in some detail. This Unit enables students to develop an appreciation of the responses of animals to common interventions that arise in the context of interacting with humans, including the domestication of livestock species and the management of wildlife. The principles of animal responses to stress are illustrated with production species as the main examples. Contemporary approaches to the scientific measurement of animal stress and welfare, based on an appropriate selection of scientific disciplines including ethology, psychology, physiology and neuroscience, are assessed with an emphasis on farmed livestock species. Genetic, environmental and evolutionary determinants of pain, stress and fear responses in animals are considered in the light of what is known about cognition and motivation in animals. Methods for assessing and enhancing animal environments and husbandry systems are examined and the impact on animal behaviour and welfare of stockmanship is explored in the context of human-animal interactions. Finally, the design and conduct of scientific experiments are assessed with a focus on animal ethics and current welfare issues.

Textbooks

Broom, DM and Fraser, AF 2007, Domestic animal behaviour and welfare, 4th edition, CAB International, Cambridge Uni Press, Cambridge
A Unit of Study outline containing details of lecture outlines, objectives, reference lists, details of practical classes, staffing as well as other relevant class material will be available for students

AVBS3XXX to be developed for offering in 2019.

Minor core

AVBS3001
Agents of Disease

Credit points: 6 **Teacher/Coordinator:** Dr Gary Muscatello **Session:** Semester 1 **Classes:** lectures 3 hours per week, laboratories/tutorials 2 hours per week, group work 1 hour per week **Prerequisites:** AVBS2001 **Assumed knowledge:** Animal and Veterinary Bioscience years 1-2 **Assessment:** 1500wd individual review (25%), 1000wd scenario-based group assignment (15%), 2 hour exam (50%), MCQ (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to examine and appreciate the diversity of various disease causing agents (microbiological and parasitological) of significance to animal industries and the various strategies employed by those agents in the host-pathogen-environment interaction. This study is based on an understanding of the physical, chemical and genetic characteristics of infectious agents of disease and builds on the pathological and immunological processes taught in AVBS2001 Introductory Veterinary Pathogenesis. A scenario/case based approach will be used whenever possible to enable the students to develop problem solving approaches and skills in critical thinking. Cases selected will be those that best illustrate particular concepts and/or are of particular significance to the animal/veterinary industry. Research and industry focus activities will infuse the subject content and student learning outcomes of this unit. This unit is located at the Camperdown campus.

Textbooks

A Unit of Study outline and LMS will contain detailed information and notes for this unit.
Recommended textbooks: Quinn PJ, Markey BK, Carter ME, Donnelly WJ and Leonard FC, 2011, Veterinary Microbiology and Microbial Disease. Blackwell Science, Oxford
Songer JG and Post KW, 2005, Veterinary Microbiology: Bacterial and Fungal Agents of Animal Disease. Saunders, St Louis
Hirsh DC, MacLachlan NJ and Walker RL, 2004, Veterinary Microbiology, Blackwell Science, Oxford

Minor selective

AVBS3002
Laboratory Disease Investigation

Credit points: 6 **Teacher/Coordinator:** A/Prof Jan Slapeta **Session:** Semester 2 **Classes:** Lectures 2 hours per week, laboratories/tutorials 4 hours per week (note these will vary depending upon the week) **Prerequisites:** 12cp from (MICR2X31 or IMMU2101 or AVBS2001 or AVBS3001) **Assumed knowledge:** CHEM1XXX and BIOL1XXX and ANSC3103 and ANSC3104 and (ENVX2001 or BIOM2001) **Assessment:** Assignments (60%), quiz (15%), theory exam (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to develop an investigative approach and familiarity with laboratory techniques, ethics and safety in preparation for honours or postgraduate training in disease research or disease investigation. Students will work through actual disease research or investigation scenarios via directed and self-directed, individual and group tasks.

Textbooks

There is no set text for this unit. Students will use primary literature and source various library texts as required for their investigations.

ANSC3106
Animal Behaviour and Welfare Science 3

Credit points: 6 **Teacher/Coordinator:** Dr Greg Cronin **Session:** Semester 2 **Classes:** 6 hours per week (including lectures, demonstrations, discussions and practical activities); classes will be held at the Camden campus **Prerequisites:** AVBS1002 **Assessment:** Assignments/presentations (50%), theory exam (50%) **Practical field work:** Practical class activities will be held at the May Farm pig unit and Camden poultry research unit, and there will be a full day excursion to Symbio Wildlife Zoo **Mode of delivery:** Normal (lecture/lab/tutorial) day

In Animal Behaviour and Welfare Science 3, the behavioural and physiological responses of mammals, birds and fish to stressors related to husbandry, housing, transport and slaughter are explored in some detail. This Unit enables students to develop an appreciation of the responses of animals to common interventions that arise in the context of interacting with humans, including the domestication of livestock species and the management of wildlife. The principles of animal responses to stress are illustrated with production species as the main examples. Contemporary approaches to the scientific measurement of animal stress and welfare, based on an appropriate selection of scientific disciplines including ethology, psychology, physiology and neuroscience, are assessed with an emphasis on farmed livestock species. Genetic, environmental and evolutionary determinants of pain, stress and fear responses in animals are considered in the light of what is known about cognition and motivation in animals. Methods for assessing and enhancing animal environments and husbandry systems are examined and the impact on animal behaviour and welfare of stockmanship is explored in the context of human-animal interactions. Finally, the design and conduct of scientific experiments are assessed with a focus on animal ethics and current welfare issues.

Textbooks

Broom, DM and Fraser, AF 2007, Domestic animal behaviour and welfare, 4th edition, CAB International, Cambridge Uni Press, Cambridge
A Unit of Study outline containing details of lecture outlines, objectives, reference lists, details of practical classes, staffing as well as other relevant class material will be available for students

AVBS3XXX to be developed for offering in 2019.

Animal Production

About the major

Contemporary animal production aims to yield high-quality products in an efficient, sustainable and humane fashion. As a student in the Animal Production major, you will:

- Learn how environment affects livestock productivity, how physiology affects production and reproduction and how to improve animal performance through the application of underpinning animal sciences.
- Study animal behaviour and learn about production systems that promote animal wellbeing and welfare.
- Acquire a sound understanding of resources required to address the challenges associated with achieving sustainable and profitable animal production enterprises.
- Graduate with a recognised industry-oriented and science-based education with a strong focus on enhancing the health, well-being and productivity of animals used in production systems, through innovative approaches.

Requirements for completion

A major in Animal Production requires 48 credit points, consisting of:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-selective units
(iii)12 credit points of 2000-level core units
(iv)12 credit points of 3000-level core units
(v)12 credit points of 3000-level selective units

A minor in Animal Production is available and articulates to this major.

First year

Core: AVBS1002 and 6cp from: BIOL1XX6 or BIOL1XX7.

Second year

Core: AVBS2004 and AVBS2006.

Students completing the second year of the Animal Production major will gain detailed knowledge on animal nutrition essential to sustain and optimise various animal production systems.

This will be complemented by a detailed understanding of animal production systems using a comparative approach to illustrate key differences, techniques and issues that need to be considered to optimise health and productivity in the various animal farming industries.

Third year

Core: AVBS3005, ANSC3106, and 12cp from: ANSC3102, AVBS3008, AVBS3009, AVBS3010

Third year students undertaking the Animal Production major will complete two units which will underpin their capacity to tackle an array of animal production challenges through an interdisciplinary project-based problem-solving unit, where issues faced by the animal farming industries are analysed and explored to produce real-world solutions.

Students will also have their experience infused by a unit which will ensure that any farming interventions are explored in an ethical manner with the welfare of the animal as a paramount concern.

Students also have the option of selecting two from an array of four units that can enable the student to gain detailed knowledge in animal reproduction to complement their general knowledge of animal production systems or they may wish to explore in detail the management and production systems used to farm pigs, poultry, ruminant livestock and aquatic creatures.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework

The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Animal Production: completion of 24 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9036 5417

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building (F07)
Eastern Avenue
The University of Sydney NSW 2006

Dr Gary Muscatello
Email: gary.muscatello@sydney.edu.au
Phone: +61 2 9114 0790

Example pathways

Those with a strong interest in **beef or sheep production** may choose the below pathway in this major:

1000-level: AVBS1002, BIOL1006
2000-level: AVBS2004, AVBS2006
3000-level: AVBS3005, ANSC3106, ANSC3102 and AVBS3010

Those with a strong interest in **aquaculture** may choose the below pathway in this major:

1000-level: AVBS1002, BIOL1007
2000-level: AVBS2004, AVBS2006
3000-level: AVBS3005, ANSC3106, AVBS3008 and AVBS3009

Learning Outcomes

Students who graduate from Animal Production will be able to:

1. Describe and understand the nature and working framework that underpin animal farming systems and develop solutions for the many challenges faced by producers.
2. Handle production animals in a safe manner to minimise risk and stress for both human and animal.
3. Describe and explain animal body systems, specifically maintenance of homeostasis and the animals' response to environmental factors and stressors.
4. Develop an integrated understanding of animal nutrition in relation to animal health, wellbeing and productivity.
5. Apply a knowledge of animal husbandry in the context of optimising meat, milk or fibre production for humans and ensure product safety prior to consumption.
6. Apply innovative technologies and systems to enhance ethical, efficient and sustainable animal production.
7. Demonstrate and communicate ethical animal farming through applied best practices adhering to social demands and acceptance.

Animal Production

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ANIMAL PRODUCTION			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Animal Production major			
A major in Animal Production requires 48 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units (iv) 12 credit points of 3000-level core units (v) 12 credit points 3000-level selective units			
Animal Production minor			
A minor in Animal Production requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units (iv) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
AVBS1002 **Concepts of Animal Management**	6	**A** AGEN1004 or BIOL1XXX or AVBS1003 **N** AGEN2006	Semester 2
Selective			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
AVBS2004 and AVBS2006 to be developed for offering in 2019.			
3000-level units of study			
Core			
ANSC3106 **Animal Behaviour and Welfare Science 3**	6	**P** AVBS1002	Semester 2
AVBS3005 to be developed for offering in 2019.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Selective			
ANSC3102 **Animal Reproduction**	6	**A** ANSC3104	Semester 1
AVBS3008, AVBS3009 and AVBS3010 to be developed for offering in 2019.			

Animal Production

ANIMAL PRODUCTION

Advanced coursework and projects will be available in 2020 for students who complete this major.

Animal Production major

A major in Animal Production requires 48 credit points from this table including:(i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level selective units(iii) 12 credit points of 2000-level core units (iv) 12 credit points of 3000-level core units (v) 12 credit points 3000-level selective units

Animal Production minor

A minor in Animal Production requires 36 credit points from this table including:(i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units(iii) 12 credit points of 2000-level core units (iv) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

AVBS1002
Concepts of Animal Management

Credit points: 6 **Teacher/Coordinator:** Dr Cameron Clark **Session:** Semester 2 **Classes:** On average 6 hours per week (lectures and practicals) **Prohibitions:** AGEN2006 **Assumed knowledge:** AGEN1004 or BIOL1XXX or AVBS1003 **Assessment:** Participation, written assignments, quizzes and end of semester examination **Practical field work:** There will be several whole day practical classes at the Camden campus **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the management of animals in natural and man-made environments. At the end of this unit of study, students will understand: the characteristics of the management systems of the major domestic species used for production in Australia and in a world wide context; the characteristics and principles underpinning sustainable management of native animals in natural and man-made environments; an appreciation of the dependence of living organisms upon their environment; an appreciation of indigenous land management and the husbandry practices and innovations that have been adopted by the production industries to retain their competitive advantage; a demonstrated capability in handling and husbandry of the major domestic production animal species, and an appreciation of the application of these skills to non-domestic species; a demonstrated understanding of the importance of high standards of animal welfare practice in the management of animals.

Textbooks
There is no single text that adequately covers the unit content and for this reason no formal text is required. Where appropriate, relevant reference material will be identified for specific areas of the course.

Selective

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

2000-level units of study

Core

AVBS2004 and AVBS2006 to be developed for offering in 2019.

3000-level units of study

Core

ANSC3106
Animal Behaviour and Welfare Science 3

Credit points: 6 **Teacher/Coordinator:** Dr Greg Cronin **Session:** Semester 2 **Classes:** 6 hours per week (including lectures, demonstrations, discussions and practical activities); classes will be held at the Camden campus **Prerequisites:** AVBS1002 **Assessment:** Assignments/presentations (50%), theory exam (50%) **Practical field work:** Practical class activities will be held at the May Farm pig unit and Camden poultry research unit, and there will be a full day excursion to Symbio Wildlife Zoo **Mode of delivery:** Normal (lecture/lab/tutorial) day

In Animal Behaviour and Welfare Science 3, the behavioural and physiological responses of mammals, birds and fish to stressors related to husbandry, housing, transport and slaughter are explored in some detail. This Unit enables students to develop an appreciation of the responses of animals to common interventions that arise in the context of interacting with humans, including the domestication of livestock species and the management of wildlife. The principles of animal responses to stress are illustrated with production species as the main examples. Contemporary approaches to the scientific measurement of animal stress and welfare, based on an appropriate selection of scientific disciplines including ethology, psychology, physiology and neuroscience, are assessed with an emphasis on farmed livestock species. Genetic, environmental and evolutionary determinants of pain, stress and fear responses in animals are considered in the light of what is known about cognition and motivation in animals. Methods for assessing and enhancing animal environments and husbandry systems are examined and the impact on animal behaviour and welfare of stockmanship is explored in the context of human-animal interactions. Finally, the design and conduct of scientific experiments are assessed with a focus on animal ethics and current welfare issues.

Textbooks

Broom, DM and Fraser, AF 2007, Domestic animal behaviour and welfare, 4th edition, CAB International, Cambridge Uni Press, Cambridge
A Unit of Study outline containing details of lecture outlines, objectives, reference lists, details of practical classes, staffing as well as other relevant class material will be available for students

AVBS3005 to be developed for offering in 2019.

Selective

ANSC3102
Animal Reproduction

Credit points: 6 **Teacher/Coordinator:** A/Prof Simon de Graaf **Session:** Semester 1 **Classes:** Lectures 2 hours per week, tutorials 1 hour per week, practicals 3 hours per week **Assumed knowledge:** ANSC3104 **Assessment:** Written and oral assignments (30%), mid-semester practical exam (15%), end of semester written exam (55%) **Practical field work:** There will be several half day practical classes held at the Camden Campus **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a comprehensive programme on basic and applied aspects of male and female reproductive biology, with particular emphasis on livestock and domestic animals. The fundamental topics include reproductive cycles, sexual differentiation, gametogenesis, fertilization, embryo development, gestation and parturition. An understanding of the applications of advanced reproductive technologies is developed through lectures, tutorials and the assignments. In addition, practical instruction is given on semen collection and processing, manipulation of the reproductive cycle, artificial insemination, and pregnancy diagnosis in sheep and pigs. Classes are held at the Camperdown Campus in Sydney and at the Camden Campus Animal Reproduction Unit and Mayfarm piggery.

Textbooks

Senger, PL 2013, Pathways to pregnancy and parturition 3rd ed., Current Conceptions Inc

AVBS3008, AVBS3009 and AVBS3010 to be developed for offering in 2019.

Animal and Veterinary Bioscience

About the stream

The Animal and Veterinary Bioscience Program provides students with fundamental and applied knowledge in animal bioscience.

Students will acquire a broad overview of both domestic animals and wildlife species and their environment, and an integrated comparative knowledge in fields such as applied biotechnologies, reproduction and nutrition. This will be supported by detailed knowledge of animal structure and function and a focus on application of innovative approaches and technologies to enhance animal management and welfare.

Students will also study animal behaviour and management systems that respect ethical and environmental concerns, and promote animal welfare. Graduates will acquire an industry-oriented science-based education which could lead to a career in a wide variety of veterinary and animal science industries.

The program is broader and more detailed than either the Animal Production major or the Animal Disease and Welfare majors, providing graduates with an all-inclusive appreciation of the multidisciplinary sciences involved in veterinary and allied animal science industries including companion and wildlife.

Requirements for completion

The Animal and Veterinary Bioscience stream is 120 credit points, consisting of:

(i)6 credit points of 1000-level degree core units
(ii)6 credit points of 2000-level degree core units
(iii)A 108 credit point program in Animal and Veterinary Bioscience

A program in Animal and Veterinary Bioscience requires 108 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)6 credit points of 2000-level core units
(iii)6 credit points of 3000-level core units
(iv)24 credit points of 4000-level research units
(v)12 credit points of 4000-level advanced coursework selective units
(vi)A 48 credit point major in Animal and Veterinary Bioscience

A major in Animal and Veterinary Bioscience requires 48 credit points, consisting of:
(i)12 credit points of 1000-level core units
(ii)18 credit points of 2000-level core units
(iii)18 credit points of 3000-level core units, including 1 interdisciplinary unit and 1 project unit

First year

Core to major: CHEM1XX1, BIOL1XX7
Core to program: AVBS1002, AVBS1003
Core to stream: ENVX1002

Second year

Core to major: AVBS2002, AVBS2003, AVBS2004
Core to program: AVBS2005
Core to stream: ENVX2001

The second year of the Animal and Veterinary Bioscience stream provides students with an opportunity to understand how animals work, through studying anatomy and physiology in a comparative manner.

Students will couple this with an understanding of the molecular and cellular nature of biochemical processes in animals, and examine how we can feed animals to enable their optimal wellbeing in both a production and natural setting.

Students will also expand upon their understanding of statistical methodologies, exploring the application and use of statistical design and methods in both natural and experimental settings as a means of answering questions about animal populations, health and wellbeing through applied animal research.

Third year

Core to major: ANSC3102, ANSC3105, ANSC3106
Core to program: AVBS3000

Students undertaking the third year of the Animal and Veterinary Bioscience stream will explore and gain in-depth understanding of three key areas of applied animal science.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in the Animal and Veterinary Bioscience area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Animal and Veterinary Bioscience: completion of 24 credit points of project work and 12 credit points of coursework.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9036 5417

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building (F07)
Eastern Avenue
The University of Sydney NSW 2006

Dr Gary Muscatello
Email: gary.muscatello@sydney.edu.au
Phone: +61 2 9114 0790

Learning Outcomes

Students who graduate from Animal and Veterinary Bioscience will be able to:

1. Understand the function of eukaryotic cells and an application of this knowledge in areas of diagnostics and screening for disease and traits in animals.
2. Understand the socio-economic importance of animals in various natural and human-made environments.
3. Work and handle animals in a safe manner to minimise risk and stress for both human and animal.
4. Understand animal body systems in detail, specifically maintenance of homeostasis and the animals' response to environmental factors and stressors.
5. Gain a detailed understanding of animal nutrition, animal biotechnologies and animal reproduction.
6. Have applied knowledge of animal behaviour, welfare and ethics in various animal-related industry and research scenarios.
7. Have an appreciation for the practical concerns of animal welfare in society and have a working knowledge of the impact of the animals' environment on behaviour and welfare.

Animal and Veterinary Bioscience

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ANIMAL AND VETERINARY BIOSCIENCE			
Animal and Veterinary Bioscience stream			
The Animal and Veterinary Bioscience stream is 120 credit points, consisting of: (i) 6 credit points of 1000-level degree core units (ii) 6 credit points of 2000-level degree core units (iii) A 108 credit point program in Animal and Veterinary Bioscience			
Animal and Veterinary Bioscience program			
This program is only available to students enrolled in Animal and Veterinary Bioscience stream. A program in Animal and Veterinary Bioscience requires 108 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 6 credit points of 2000-level core units (iii) 6 credit points of 3000-level core units (iv) 24 credit points of 4000-level research units (v) 12 credit points of 4000-level advanced coursework selective units (vi) A 48 credit point major in Animal and Veterinary Bioscience			
Animal and Veterinary Bioscience major			
This major is only available to students enrolled in Animal and Veterinary Bioscience program. A major in Animal and Veterinary Bioscience requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units, including 1 interdisciplinary unit and 1 project unit			
Units of study			
The units of study are listed below.			
1000-level units of study			
Stream Core			
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
Program core			
AVBS1002 **Concepts of Animal Management**	6	**A** AGEN1004 or BIOL1XXX or AVBS1003 **N** AGEN2006	Semester 2
AVBS1003 **Animals and Us**	6	**N** VETS1018	Semester 1
Major core			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Stream core			
ENVX2001 **Applied Statistical Methods**	6	**P** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
Program core			
AVBS2005 to be developed for offering in 2019.			
Major core			
AVBS2002, AVBS2003 and AVBS2004 to be developed for offering in 2019.			
3000-level units of study			
Program core			
AVBS3000 **Professional Development**	6		Semester 1 Semester 2
Major core			
ANSC3102 **Animal Reproduction**	6	**A** ANSC3104	Semester 1
ANSC3105 **Animal Biotechnology**	6		Semester 2
ANSC3106 **Animal Behaviour and Welfare Science 3**	6	**P** AVBS1002	Semester 2
4000-level units of study			
Research units			
AVBS4015 **Research Project A1**	6	**P** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **C** AVBS4016 and AVBS4017 and AVBS4018 **N** AVBS4013 or AVBS4014	Semester 1 Semester 2
AVBS4016 **Research Project A2**	6	**P** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **C** AVBS4015 and AVBS4017 and AVBS4018 **N** AVBS4013 or AVBS4014	Semester 1 Semester 2
AVBS4017 **Research Project A3**	6	**P** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **C** AVBS4015 and AVBS4016 and AVBS4018 **N** AVBS4013 or AVBS4014	Semester 1 Semester 2
AVBS4018 **Research Project A4**	6	**P** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **C** AVBS4015 and AVBS4016 and AVBS4017 **N** AVBS4013 or AVBS4014	Semester 1 Semester 2
Selective advanced coursework units			
AVBS4002 **Dairy Production and Technology**	6	**A** Enrolled students are expected to have some understanding of key components of the dairy production system, including basic knowledge of animal physiology and nutrition.	Semester 2
AVBS4004 **Food Safety Assessment and Management**	6	**P** AVBS3001 and AVBS4001	Semester 2
AVBS4005 **Feed Technology**	6	**P** ANSC3101	Semester 1
AVBS4012 **Extensive Animal Industries**	6	**P** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AVBS4019 **Equine Science and Industry**	6		Semester 2

Animal and Veterinary Bioscience

ANIMAL AND VETERINARY BIOSCIENCE

Animal and Veterinary Bioscience stream

The Animal and Veterinary Bioscience stream is 120 credit points, consisting of:(i) 6 credit points of 1000-level degree core units(ii) 6 credit points of 2000-level degree core units(iii) A 108 credit point program in Animal and Veterinary Bioscience

Animal and Veterinary Bioscience program

This program is only available to students enrolled in Animal and Veterinary Bioscience stream.A program in Animal and Veterinary Bioscience requires 108 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 6 credit points of 2000-level core units(iii) 6 credit points of 3000-level core units(iv) 24 credit points of 4000-level research units(v) 12 credit points of 4000-level advanced coursework selective units(vi) A 48 credit point major in Animal and Veterinary Bioscience

Animal and Veterinary Bioscience major

This major is only available to students enrolled in Animal and Veterinary Bioscience program.A major in Animal and Veterinary Bioscience requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units(ii) 18 credit points of 2000-level core units(iii) 18 credit points of 3000-level core units, including 1 interdisciplinary unit and 1 project unit

Units of study

The units of study are listed below.

1000-level units of study

Stream Core

ENVX1002
Introduction to Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Thomas Bishop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour tutorial per week, one 2-hour computer practical per week **Prohibitions:** ENVX1001 **Assessment:** One exam during the exam period (50%), three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This is an introductory statistics unit for students in the agricultural, life and environmental sciences. It provides the foundation for statistics and data science skills that are needed for a career in science and for further study in applied statistics and data science. In the first portion of the unit the emphasis is on describing data using statistical and graphical summaries, and probability models. In the second part the focus is on formal hypothesis testing on experimental data using statistical tests. The final part of the unit is on finding patterns in biological and environmental data, through the use of linear and non-linear functions. In the practicals the emphasis is on applying theory to analysing real datasets using the spreadsheet package Excel and the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

Program core

AVBS1002
Concepts of Animal Management

Credit points: 6 **Teacher/Coordinator:** Dr Cameron Clark **Session:** Semester 2 **Classes:** On average 6 hours per week (lectures and practicals) **Prohibitions:** AGEN2006 **Assumed knowledge:** AGEN1004 or BIOL1XXX or AVBS1003 **Assessment:** Participation, written assignments, quizzes and end of semester examination **Practical field work:** There will be several whole day practical classes at the Camden campus **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the management of animals in natural and man-made environments. At the end of this unit of study, students will understand: the characteristics of the management systems of the major domestic species used for production in Australia and in a world wide context; the characteristics and principles underpinning sustainable management of native animals in natural and man-made environments; an appreciation of the dependence of living organisms upon their environment; an appreciation of indigenous land management and the husbandry practices and innovations that have been adopted by the production industries to retain their competitive advantage; a demonstrated capability in handling and husbandry of the major domestic production animal species, and an appreciation of the application of these skills to non-domestic species; a demonstrated understanding of the importance of high standards of animal welfare practice in the management of animals.

Textbooks

There is no single text that adequately covers the unit content and for this reason no formal text is required. Where appropriate, relevant reference material will be identified for specific areas of the course.

AVBS1003
Animals and Us

Credit points: 6 **Teacher/Coordinator:** Prof Claire Wade **Session:** Semester 1 **Classes:** Two lectures; one 3-hour practical; one peer assisted study session per week **Prohibitions:** VETS1018 **Assessment:** Assignments, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

We live in a world surrounded by and dependent on animals. Australia has one of the highest rates of animal ownership in the world: dogs, cats, rabbits, birds and reptiles being common. In this unit, you explore animals in society (including companion, pocket and pet, wildlife and zoo animals). You will investigate relationships between humans and animals and normal function of animals including development, disease, aging and death. This unit will describe how human and animal health are related, outline legislation and policies on the care and use of animals, cover topical issues in animal welfare and ethics, provide opportunities for students to observe animal behaviours and discuss how cultural backgrounds influence our relationships with animals. You will visit captive and clinical animal facilities where animals are displayed for conservation, curiosity, aesthetics and research. Practicals and workshops will provide students with skills in critical thinking, communication, information/digital literacy and an evidence informed basis on which to make decisions. This unit is for students who are interested in a professional career working with animals, such as those in the AVBS stream and BVB/DVM program or who generally seek an understanding of how animals enrich our lives.

Textbooks

Animals and Us Unit of Study Guide and Practical Manual TBD

Major core

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

2000-level units of study

Stream core

ENVX2001
Applied Statistical Methods

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 3-hour computer practical per week **Prerequisites:** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] **Assessment:** One exam during the exam period (50%),three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This unit builds on introductory 1st year statistics units and is targeted towards students in the agricultural, life and environmental sciences. It consists of two parts and presents, in an applied manner, the statistical methods that students need to know for further study and their future careers. In the first part the focus is on designed studies including both surveys and formal experimental designs. Students will learn how to analyse and interpret datasets collected from designs from more than than 2 treatment levels, multiple factors and different blocking designs. In the second part the focus is on finding patterns in data. In this part the students will learn to model relationships between response and predictor variables using regression, and find patterns in datasets with many variables using principal components analysis and clustering. This part provides the foundation for the analysis of big data. In the practicals the emphasis is on applying theory to analysing real datasets using the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

Program core

AVBS2005 to be developed for offering in 2019.

Major core

AVBS2002, AVBS2003 and AVBS2004 to be developed for offering in 2019.

3000-level units of study

Program core

AVBS3000
Professional Development

Credit points: 6 **Teacher/Coordinator:** Dr Sabrina Lomax **Session:** Semester 1, Semester 2 **Classes:** Six preparatory workshops/seminars (throughout years 1-3), four 1-hour industry seminars for case studies (year 3) **Assessment:** Professional experience reports (65%), case studies (20%), essay on current animal issues (15%) **Practical field work:** 60 days of professional work experience to be completed by the commencement of fourth year **Mode of delivery:** Professional practice

Students are required to undertake professional development in University vacations as an integral and essential part of their overall training in the degree of Bachelor of Animal and Veterinary Bioscience. Students will complete 60 days of professional work experience throughout their program by the commencement of fourth year, including a minimum of 20 days spent on commercial animal production enterprises. Students will visit at least two different farming enterprises in the major and emerging animal production industries. The remaining 40 days will include at least one placement with an animal-related business or service provider, and experience in either a scientific research organisation or short scientific volunteer position. Students will undertake additional placements at relevant animal or animal-related businesses, farms or organisations as required to complete 60 days. A professional consultant-style report must be submitted after each placement. Seminars to promote awareness of career options and current issues in animal science will be provided on a regular basis by past graduates and other professionals working in the animal industries. Students are encouraged to attend as many of these as possible throughout their degree program, and are required to submit four case studies based on material presented in these seminars. Attendance at seminars is compulsory during third year. Students will also submit an essay on a current issue in the animal science area of their choice.

Textbooks

On-line resource material will be available

Major core

ANSC3102
Animal Reproduction

Credit points: 6 **Teacher/Coordinator:** A/Prof Simon de Graaf **Session:** Semester 1 **Classes:** Lectures 2 hours per week, tutorials 1 hour per week, practicals 3 hours per week **Assumed knowledge:** ANSC3104 **Assessment:** Written and oral assignments (30%), mid-semester practical exam (15%), end of semester written exam (55%) **Practical field work:** There will be several half day practical classes held at the Camden Campus **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a comprehensive programme on basic and applied aspects of male and female reproductive biology, with particular emphasis on livestock and domestic animals. The fundamental topics include reproductive cycles, sexual differentiation, gametogenesis, fertilization, embryo development, gestation and parturition. An understanding of the applications of advanced reproductive technologies is developed through lectures, tutorials and the assignments. In addition, practical instruction is given on semen collection and processing, manipulation of the reproductive cycle, artificial insemination, and pregnancy diagnosis in sheep and pigs. Classes are held at the Camperdown Campus in Sydney and at the Camden Campus Animal Reproduction Unit and Mayfarm piggery.

Textbooks

Senger, PL 2013, Pathways to pregnancy and parturition 3rd ed., Current Conceptions Inc

ANSC3105
Animal Biotechnology

Credit points: 6 **Teacher/Coordinator:** Assoc. Prof. Peter Williamson **Session:** Semester 2 **Classes:** Lectures 3 hours per week, tutorials 1 hour per week, practicals 2-3 hours for seven weeks **Assessment:** Practicals and quizzes (30%), essay and seminars (30%), exam (40%) **Practical field work:** laboratory practical classes **Mode of delivery:** Normal (lecture/lab/tutorial) day

Lectures, tutorials, laboratories, seminars and supervised reading and directed learning instruction will cover the application of biotechnology to animal health, animal production and veterinary biosciences. The course is organised around modules that consider the methodologies, ethical and technical issues in application veterinary regenerative technology (gene therapy; stem cell therapy), transgenic technologies, antibody and antigen receptor engineering, molecular diagnostics, and mining molecular bioactives, all discussed in contexts relevant to domestic animals. The course also integrates an introduction to the emerging field of animal biosystems, which covers the application of big data in animal biotechnology.

ANSC3106
Animal Behaviour and Welfare Science 3

Credit points: 6 **Teacher/Coordinator:** Dr Greg Cronin **Session:** Semester 2 **Classes:** 6 hours per week (including lectures, demonstrations, discussions and practical activities); classes will be held at the Camden campus **Prerequisites:** AVBS1002 **Assessment:** Assignments/presentations (50%), theory exam (50%) **Practical field work:** Practical class activities will be held at the May Farm pig unit and Camden poultry research unit, and there will be a full day excursion to Symbio Wildlife Zoo **Mode of delivery:** Normal (lecture/lab/tutorial) day

In Animal Behaviour and Welfare Science 3, the behavioural and physiological responses of mammals, birds and fish to stressors related to husbandry, housing, transport and slaughter are explored in some detail. This Unit enables students to develop an appreciation of the responses of animals to common interventions that arise in the context of interacting with humans, including the domestication of livestock species and the management of wildlife. The principles of animal responses to stress are illustrated with production species as the main examples. Contemporary approaches to the scientific measurement of animal stress and welfare, based on an appropriate selection of scientific disciplines including ethology, psychology, physiology and neuroscience, are assessed with an emphasis on farmed livestock species. Genetic, environmental and evolutionary determinants of pain, stress and fear responses in animals are considered in the light of what is known about cognition and motivation in animals. Methods for assessing and enhancing animal environments and husbandry systems are examined and the impact on animal behaviour and welfare of stockmanship is explored in the context of human-animal interactions. Finally, the design and conduct of scientific experiments are assessed with a focus on animal ethics and current welfare issues.

Textbooks

Broom, DM and Fraser, AF 2007, Domestic animal behaviour and welfare, 4th edition, CAB International, Cambridge Uni Press, Cambridge
A Unit of Study outline containing details of lecture outlines, objectives, reference lists, details of practical classes, staffing as well as other relevant class material will be available for students

4000-level units of study

Research units

AVBS4015
Research Project A1

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Muir **Session:** Semester 1, Semester 2 **Classes:** Students must attend the compulsory course "Introduction to Animal Research (ITAR)" which is usually held in the week prior to the start of semester. There is no regular face-to-face teaching. The equivalent of 6 hours per week will be allocated from the course work timetable for research project activity. Relevant workshops, for example on scientific writing and statistical analysis will be completed during the sessions when the student is enrolled in AVBS4015, AVBS4016, AVBS4017 and AVBS4018. **Prerequisites:** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **Corequisites:** AVBS4016 and AVBS4017 and AVBS4018 **Prohibitions:** AVBS4013 or AVBS4014 **Assessment:** written preliminary research proposal, literature review on the research topic, oral presentation on the research proposal, oral presentation on the research at the end of the project, research capabilities, written manuscript (assessment tasks scheduled throughout the four units comprising Research Project A (AVBS4015, AVBS4016, AVBS4017, ABVS4018) with the final grade averaged over all four units) **Practical field work:** Dependent on the particular research project **Mode of delivery:** Normal (lecture/lab/tutorial) day

Research Project A is composed of 24 credit points and consists of units AVBS4015 (Research Project A1), AVBS4016 (Research Project A2), AVBS4017 (Research Project A3) and AVBS4018 (Research Project A4). The units need to be taken in chronological order, commencing with enrolment in unit AVBS4015, which must be completed in a semester prior to unit AVBS4018. All four units are connected to the overall completion of the research project. Prior to start of this unit of study, students after consultation with an academic(s) and/or researcher(s) choose an area of research interest and this will form the basis of the entire Research Project A program (24 credit points in total). In unit AVBS4015 students will be required to undertake assessment tasks and conduct research activities.

At the end of this Unit of Study, students will:

Identify a research area, define a problem that impacts on animals and analyse this problem using information from various sources; critically evaluate current research (experimental design, statistical analysis, technical limitations) and identify where the present knowledge limiting for the chosen research topic; assimilate and manage information from within and across disciples to provide new concepts or understanding in the area of research; become familiar with scientific principles of research and the ethical use of animals in research; undertake research related to the project; meet set assessment tasks designed to develop written and oral presentation skills; apply the range of interpersonal skills necessary to work with peers and other researchers; meet deadlines and maintain accurate records related to the project.

Textbooks

No textbooks are required

AVBS4016
Research Project A2

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Muir **Session:** Semester 1, Semester 2 **Classes:** There is no regular face-to-face teaching. The equivalent of 6 hours per week will be allocated from the course work timetable for research project activity. Relevant workshops, for example on scientific writing and statistical analysis will be completed during the sessions when the student is enrolled in AVBS4015, AVBS4016, AVBS4017 and AVBS4018. **Prerequisites:** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **Corequisites:** AVBS4015 and AVBS4017 and AVBS4018 **Prohibitions:** AVBS4013 or AVBS4014 **Assessment:** See AVBS4015 **Practical field work:** Dependent on the particular research project **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students will actively work on the research projects identified at the start of unit AVBS4015. This is will include, where appropriate, undertaking animal and laboratory studies, collection and analysis of samples and data, recording of data, continue to evaluate information from various sources and meet set assessment deadlines.

See under AVBS4015 for further information.

AVBS4017
Research Project A3

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Muir **Session:** Semester 1, Semester 2 **Classes:** The equivalent of 6 hours per week will be allocated from the coursework timetable for research project activity. Relevant workshops, for example on scientific writing and statistical analysis will be completed during the sessions when the student is enrolled in AVBS4015, AVBS4016, AVBS4017 and AVBS4018 **Prerequisites:** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **Corequisites:** AVBS4015 and AVBS4016 and AVBS4018 **Prohibitions:** AVBS4013 or AVBS4014 **Assessment:** See AVBS4015 **Practical field work:** Dependent on the particular research project **Mode of delivery:** Normal (lecture/lab/tutorial) day

See under AVBS4015 and AVBS4016.

AVBS4018
Research Project A4

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Muir **Session:** Semester 1, Semester 2 **Classes:** There is no regular face-to-face teaching. The equivalent of 6 hours per week will be allocated from the coursework timetable for research project activity. Relevant workshops, for example on scientific writing and statistical analysis will be completed during the sessions when the student is enrolled in AVBS4015, AVBS4016, AVBS4017 and AVBS4018. **Prerequisites:** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **Corequisites:** AVBS4015 and AVBS4016 and AVBS4017 **Prohibitions:** AVBS4013 or AVBS4014 **Assessment:** See AVBS4015 **Practical field work:** Dependent on the particular research project **Mode of delivery:** Normal (lecture/lab/tutorial) day

See under AVBS4015 and AVBS4016. Students must complete unit AVBS4018 in a separate semester to unit AVBS4015, and AVBS4015 must be completed prior to AVBS4018.

Selective advanced coursework units

AVBS4002
Dairy Production and Technology

Credit points: 6 **Teacher/Coordinator:** Prof Sergio (Yani) Garcia **Session:** Semester 2 **Classes:** Lectures up to 3 hours per week, practicals 3 hours per week **Assumed knowledge:** Enrolled students are expected to have some understanding of key components of the dairy production system, including basic knowledge of animal physiology and nutrition. **Assessment:** Assignment (report or lit review) (30%), pracs assessments, (30%), 1-hour exam (40%) **Practical field work:** At least two half day field trips and one or two full day trips/excursions including commercial farms and a milk processing plant **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the various aspects of dairy farming and the dairy industry from a scientific point of view. The lectures are a mix of the principles on which sound dairy farming is based and practical examples of how this operates in practice. Focus is placed on integrating knowledge to gain understanding on the system of production as a whole. At the end of this unit of study, students will demonstrate a solid understanding of: the characteristics of the dairy industry in Australia and in a world wide context; the key components of pasture-based dairy systems; principles and practices of pasture and feeding management; the application of new technologies to improve efficiency and productivity (particularly automatic milking). In addition, students will demonstrate an appreciation of key aspects of reproduction and lactation physiology; the integration of knowledge of genetics and reproduction into the type of herd improvement structure set up in the dairy industry; the application of ruminant physiology knowledge to developing feeding programs for dairy cows; the extension of basic reproductive physiology onto the dairy farm using case studies as examples; the economics of the dairy farm business. Practical classes include milking cows; grazing and feeding management of dairy cows; calf rearing; and visits to commercial farms ranging from small pasture-based dairy farms to a feed-lot operation milking over 2,000 cows.

Textbooks

Students are advised to consult lecturers for recommended text, scientific and professional articles, technotes for advisors and industry-generated information for farmers

AVBS4004
Food Safety Assessment and Management

Credit points: 6 **Teacher/Coordinator:** Dr Gary Muscatello **Session:** Semester 2 **Classes:** Lectures 3 hours per week, tutorial/practicals 2 hours per week **Prerequisites:** AVBS3001 and AVBS4001 **Assessment:** 1000wd individual report (20%), 1000wd group assignment (20%), 2-hour exam (50%), MCQ (10%) **Practical field work:** Two field trips (compulsory) 16 hours total **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study focuses on the issues and practices in the animal industry relevant to food safety and zoonotic disease. This unit will cover general food safety issues, including risk assessment and hazard analysis of microbes and chemicals. Food-borne diseases of animal origin and their impact on public heath will be explored through the examination of zoonotic diseases in scenario-based learning activities. In these processes diagnostic and strategic methods of investigating, controlling and preventing food-borne disease outbreaks will be explored. Students will be introduced to national and international animal and human health policy pertaining to food safety regulations and surveillance initiatives and strategies that underpin these policies. Students in this unit will be introduced to the issues regarding emerging food-borne pathogens and current industry driven topics. By the end of the unit, students should have global and local perspective on the major food-borne diseases, surveillance and control programs. This unit is located at the Camden Campus.

Textbooks

Torrence ME and Isaacson RE (eds) 2003, Microbial food safety in animal agriculture current topics, Iowa State Press, Ames, Iowa
D'Mello JPF (ed.) 2003, Food safety: contaminants and toxins, CABI Publishing, Wallingford
Bucic S 2006, Integrated food safety and veterinary public health, CABI Publishing, Wallingford
Jay JM, Loessner MJ, Golden DA 2005, Modern Food Microbiology, 7th edn, Springer, New York
Colville J, Berryhill, D 2007, Handbook of Zoonoses - Identification and Prevention, Elsevier Mosby, St.Louis, MO USA

AVBS4005
Feed Technology

Credit points: 6 **Teacher/Coordinator:** Dr Cormac OÂ¿Shea **Session:** Semester 1 **Classes:** Lectures three hours per week **Prerequisites:** ANSC3101 **Assessment:** Debate (10%), one page argument (10%), article (15%), lab book and feed formulation exercises (25%), 2-hour written exam (40%) **Practical field work:** Practicals/field work 3hrs/wk **Mode of delivery:** Normal (lecture/lab/tutorial) day

Feed accounts for approximately 70% of the input costs associated with animal industries, including both monogastric (poultry and pigs, laboratory animals) ruminants (feedlot cattle and sheep) and caecal fermenters (horses, rabbits). The "feed industry" is described as the largest supporting industry for animal agriculture and is a major employer of graduates (undergraduate and postgraduate). Feed technology is a broad topic and includes aspects of feed ingredient characteristics, feed manufacturing, feed additive biotechnology and applied nutrition. The course will provide in-depth understanding of the feed industry, factors influencing ingredient variability and availability (physical and economic), methods and applications of processing of ingredients to increase nutritional value, assessment of digestibility, and feed additives and supplements. All facets of the production and regulation of feed production will be discussed relative to their importance in animal agriculture and food production. Expect applied practical information as well as fairly detailed nutritional biochemistry.

Textbooks

No textbook required

AVBS4012
Extensive Animal Industries

Credit points: 6 **Teacher/Coordinator:** A/Prof Russell Bush **Session:** Semester 1 **Classes:** Lectures 3 hours per week, practicals 3 hours per week **Prerequisites:** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3 **Assessment:** Case study (10%), practical report (15%), meat grading (15%), excursion report (20%) and written exam (40%) **Practical field work:** Five-day study tour to the Riverina **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces the concepts of sheep (wool and meat) and beef cattle production in the Australian environment within the context of world food and fibre consumption and production. The key products as well as domestic and export markets for these are presented. The course provides an historical perspective of the basis for each of these industries and describes each of the production systems designed to meet the demand for these products.

Production in both the tropical and temperate regions of Australia will be covered and include the key elements of extensive grazing and intensive feedlot systems. Major issues will include breeds and breeding systems, basic nutrition and production practices and animal welfare issues as they affect the quality and quantity of product marketed.

The concepts of first stage processing of both meat and fibre products in abattoirs and top-making plants respectively will be presented. The major factors that influence the quality of product and therefore grading and market demand will be presented.

Lecture material will be supported with appropriate practical classes and a 5 day study tour to the Riverina to evaluate different commercial production systems. Students will also have an opportunity to compete in the annual Inter Collegiate Meat Judging (ICMJ) competition as a member of the University of Sydney team. This competition involves teams from numerous universities throughout Australia as well as Japan and the USA.

AVBS4019
Equine Science and Industry

Credit points: 6 **Teacher/Coordinator:** Dr Natasha Hamilton **Session:** Semester 2 **Classes:** One day a week, variable **Assessment:** Assignments (50%), mid-semester and final examinations (50%) **Practical field work:** Two offsite excursions to a racetrack and a commecrial horse stud **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study will give students wishing to work in the equine industries a strong scientifically based grounding in this field. The emphasis is on developing the students' basic knowledge of equine management, including day to day care, nutrition, reproduction, behaviour and training, disease and exercise physiology. Students will be introduced to the structure of equine industries in Australia, and basic horse handling and husbandry skills will be taught.

Textbooks

Equine Science, Pillner and Davies

Applied Medical Science

Study in the Discipline of Applied Medical Science is offered by the Sydney Medical School. Specific Applied Medical Science units of study are offered at 3000-level.

About the major

This major is available to students outside the Medical Science stream.

This major positions students at the intersection of science and medicine, giving them a fundamental understanding of human health and the mechanisms of diseases, their diagnosis, prevention and treatment. Graduates will be equipped with the insights and skills to understand ongoing scientific discoveries, and apply that knowledge to clinical situations.

The ability to apply theory to practice in medical science is essential for professionals addressing the major global health issues, such as mental health and neurodegenerative diseases, obesity, diabetes, cardiovascular disease, infections, cancer and auto-inflammatory disease. In this major you will learn the strategies by which medical science theory is translated into tangible health outcomes.
Through an understanding of fundamental medical science theory, you will learn the methods used to diagnose and treat human diseases, and how approaches to the diagnosis, treatment and prevention of human disease are developed and tested prior to implementation.
You will learn: the molecular basis of disease; how complex data generated in medical sciences are analysed, interpreted and communicated by the healthcare sector; how well-designed clinical trials can be used to test and verify the efficacy of new procedures and treatment options.
All this learning and application will occur in the real world in our medical research and hospital environment: the translational research hub at The University of Sydney Westmead campus.

Requirements for completion

A major in Applied Medical Science requires 48 credit points, consisting of:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level selective units
(iii)6 credit points of 2000-level core units
(iv)6 credit points of 2000-level selective units
(v)24 credit points of 3000-level core units

A minor in Applied Medical Science is available and articulates to this major.

First year

BIOL1XX7 and 6 credit points from: CHEM1XX1 or BIOL1XX8 (Medical science students enrol in MEDS1X01 instead).

Second year

IMMU2101/MIMI2X02 and 6 credit points from PHSI2X05 or PCOL2011 or BCMB2X01 (Medical science students enrol in BMED2404/MEDS2004 instead and do 6 credit points from: MEDS2001 or MEDS2002 or MEDS2003).

Third year

Core: AMED3001, AMED3002, AMED3003, AMED3004.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours

Requirements for Honours in the area of Applied Medical Science: completion of 36 credit points of project work and 12 credit points of coursework.

Contact and further information

Associate Professor Scott Byrne
T +61 2 9351 7308
E scott.byrne@sydney.edu.au

Learning Outcomes

Students who graduate from Applied Medical Science will be able to:

1. Explain the fundamental role of basic scientific research and how it is translated from bench to bedside
2. Achieve competence in a range of valuable diagnostic techniques and data-gathering skills
3. Apply these techniques to address a diverse range of health-related problems
4. Explain the basics of clinical trials design and the important roles they play in the medical research enterprise
5. Describe the need for rigorous ethical, legal and biosafety assessments in medical research
6. Navigate, analyse, interpret, represent and communicate 'big data'
7. Read, understand and communicate the various types of scientific literature and multimedia that relate to human health
8. Take an active part in addressing complex scientific challenges relevant to the improvement of human health through medical science
9. Communicate their learning and findings in the applied medical sciences to diverse audiences through the use of conventional and multimedia platforms
10. Describe the processes by which discoveries in medical science become commercial products.

Applied Medical Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
APPLIED MEDICAL SCIENCE			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Applied Medical Science major			
A major in Applied Medical Science requires 48 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 24 credit points of 3000-level core units			
Applied Medical Science minor			
A minor in Applied Medical Science requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 6 credit points of 3000-level core units (vi) 6 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Selective			
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			
2000-level units of study			
Core			
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
MEDS2004 and MIMI2X02 to be developed for offering in 2019.			
Selective			
PHSI2005 **Integrated Physiology A**	6	**P** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PHSI2905 **Integrated Physiology A (Advanced)**	6	**P** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PCOL2011 **Pharmacology Fundamentals**	6	**A** BIOL1XXX or MBLG1XX1 **P** 6cp from CHEM1XXX **N** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
MEDS2001, MEDS2002 and MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Major core			
AMED3001 **Cancer**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
AMED3002 **Interrogating Biomedical and Health Data**	6	**A** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
AMED3003 **Diagnostics and Biomarkers**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
AMED3004 **Clinical Science**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
Minor core			
AMED3004 **Clinical Science**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
Minor selective			
AMED3001 **Cancer**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
AMED3002 **Interrogating Biomedical and Health Data**	6	**A** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
AMED3003 **Diagnostics and Biomarkers**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Applied Medical Science

APPLIED MEDICAL SCIENCE

Advanced coursework and projects will be available in 2020 for students who complete this major.

Applied Medical Science major

A major in Applied Medical Science requires 48 credit points from this table including:(i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units(iii) 6 credit points of 2000-level core units(iv) 6 credit points of 2000-level selective units (v) 24 credit points of 3000-level core units

Applied Medical Science minor

A minor in Applied Medical Science requires 36 credit points from this table including:(i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units(v) 6 credit points of 3000-level core units (vi) 6 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

Selective

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks
TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Core

BMED2404
Microbes, Infection and Immunity

Credit points: 6 **Teacher/Coordinator:** Dr Jim Manos **Session:** Semester 2 **Classes:** Two lectures and one practical per week, two tutorials **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), in-semester assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study begins by introducing the concepts of disease transmission, pathogenicity and virulence mechanisms of microbes. For a full understanding of the process of infection, the structure and function of pathogenic microorganisms is examined. How the body deals with injury and infection is discussed by exploring barriers to infection and host response once those barriers are breached. The body's response to such physical damage is dealt with in a series of lectures on wound healing, clotting and inflammation, and is complemented by discussion of the pharmacological basis of anti-inflammatory drugs. This is followed by a comprehensive discussion of molecular and cellular immune responses to pathogen invasion. In particular, this gives students an appreciation of the processing of antigens, the structure, production and diversity of antibodies, the operation of the complement system and mechanisms for recognition and destruction of invading microbes. The unit concludes with an overview of microbial diseases, the characteristics of causative agents, pathogenesis and symptoms as well as treatment and control and culminates with exploring current issues of antibiotic resistance, important emerging infections and vaccination strategies.

Practical classes illustrate and underpin the lecture content. Students will investigate normal flora, host defences and medically important microbes and will obtain experience in, and an understanding of, a range of techniques in bacteriology. In these practical sessions experience will be gained handling live, potentially pathogenic microbes.

Textbooks
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
Basic Immunology: Functions and Disorders of the Immune System. Abass AK and Lichtman AH WB Saunders, 4th Edition, 2013
Robbins Basic Pathology Kumar V, Abbas AK and Aster J Saunders, Philadelphia, 9th Edition, 2013

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1 **Assessment:** Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks
Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

MEDS2004 and MIMI2X02 to be developed for offering in 2019.

Selective

PHSI2005
Integrated Physiology A

Credit points: 6 **Teacher/Coordinator:** Dr Michael Morris **Session:** Semester 1 **Classes:** Three 1 hour lectures per week. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual written assessments, and quizzes (100%) **Practical field work:** One 3 hour practical or one 3 hour tutorial per week. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study offers an introduction to the basic concepts underpinning physiology, excitable cell (nerve and muscle) physiology, as well as the functions of the nervous system (central processing, and sensory and motor systems). It also incorporates cardiovascular and exercise physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Tutorial sessions develop critical thinking, the integrative nature of physiology, and generic skills in scientific writing and presentation. The practicals and tutorials also emphasise group learning and team work.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 7th edition. 2015. ISBN-10: 0321981227; ISBN-13: 978-0321981226 (International Edition)

PHSI2905
Integrated Physiology A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 1 **Classes:** Five 1 hour lectures, one 3 hour practical and one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. Students will also be exempt from all Inquiry-based learning tutorials. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2005 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2005. This unit of study offers a basic introduction to the functions of the nervous system, excitable cell (nerve and muscle) physiology, sensory and motor systems, and central processing. It also incorporates haematology and cardiovascular physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Inquiry-based learning sessions develop critical thinking and generic skills while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2010. ISBN 10:0-321-1750071; ISBN 13:978-0-321-750075 (International Edition).

PCOL2011
Pharmacology Fundamentals

Credit points: 6 **Teacher/Coordinator:** Dr Hilary Lloyd **Session:** Semester 1 **Classes:** Lectures (2 x1 hr per week); wet and dry labs (5 x4 hrs), data anaylsis tutorials (2 x 2 hrs); workshops (6 x 2 hrs) **Prerequisites:** 6cp from CHEM1XXX **Prohibitions:** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XXX or MBLG1XX1 **Assessment:** In-semester (40%), which consists of 4 x on-line quizzes, 2 x lab reports, 3 x research topics, 1 x oral presentation, end-of-semester examination (60%), which consists of multiple choice and short answer questions **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides the fundamental grounding in four basic areas in Pharmacology: (1) principles of drug action (2) pharmacokinetics and drug metabolism (3) experimental design and autonomic pharmacology, and (4) drug design. The delivery of material involves lectures, practicals, computer-aided learning and problem-based workshops. Practical classes provide students with the opportunity of acquiring technical experience and teamwork skills. Problem-based workshops are based on real-life scenarios of drug use in the community. These workshops require students to integrate information obtained in lectures in order to provide solutions to the problems. Online quizzes accompany each module and are to encourage continued learning throughout the semester.

Textbooks

Rang and Dale's Pharmacology, 8th Edition. H. P. Rang, J. M. Ritter, R. J. Flower, and G. Henderson, (Elsevier 2016). Medical Pharmacology at a Glance, 7th edn M.J. Neal: (Blackwell Scientific Publications, 2012).

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901
Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

MEDS2001, MEDS2002 and MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Major core

AMED3001
Cancer

Credit points: 6 **Teacher/Coordinator:** Assoc Prof Scott Byrne **Session:** Semester 1 **Classes:** interactive face to face activities 4 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, assignments, quiz, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

What does it mean when someone tells you: "you have cancer"? Initially you're probably consumed with questions like: "how did this happen?" and "will this cancer kill me?". In this unit, we will explore all aspects of the "cancer problem" from the underlying biomedical and environmental causes, through to emerging approaches to cancer diagnosis and treatment. You will integrate medical science knowledge from a diverse range of disciplines and apply this to the prevention, diagnosis and treatment of cancer both at the individual and community level. Together we will explore the epidemiology, aetiology and pathophysiology of cancer. You will be able to define problems and formulate solutions related to the study, prevention and treatment of cancer with consideration throughout for the economic, social and psychological costs of a disease that affects billions. Face-to-face and online learning activities will allow you to work effectively in individual and collaborative contexts. You will acquire the skills to interpret and communicate observations and experimental findings related to the "cancer problem" to diverse audiences. Upon completion, you will have developed the foundations that will allow you to follow a career in cancer research, clinical and diagnostic cancer services and/or the corporate system that supports the health care system.

Textbooks

Recommended Textbook: 1.,Weinberg (2013) The Biology of Cancer. 2nd edition. Garland Science Recommended reading: 1.,Hanahan and Weinberg (2000). The hallmarks of cancer. Cell 100, 57-70. 2.,Hanahan and Weinberg (2011). Hallmarks of cancer: the next generation. Cell 144, 646-74

AMED3002
Interrogating Biomedical and Health Data

Credit points: 6 **Teacher/Coordinator:** Prof Jean Yang **Session:** Semester 1 **Classes:** face to face 5 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assumed knowledge:** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. **Assessment:** in-semester exam, assignments, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Biotechnological advances have given rise to an explosion of original and shared public data relevant to human health. These data, including the monitoring of expression levels for thousands of genes and proteins simultaneously, together with multiple databases on biological systems, now promise exciting, ground-breaking discoveries in complex diseases. Critical to these discoveries will be our ability to unravel and extract information from these data. In this unit, you will develop analytical skills required to work with data obtained in the medical and diagnostic sciences. You will explore clinical data using powerful, state of the art methods and tools. Using real data sets, you will be guided in the application of modern data science techniques to interrogate, analyse and represent the data, both graphically and numerically. By analysing your own real data, as well as that from large public resources you will learn and apply the methods needed to find information on the relationship between genes and disease. Leveraging expertise from multiple sources by working in team-based collaborative learning environments, you will develop knowledge and skills that will enable you to play an active role in finding meaningful solutions to difficult problems, creating an important impact on our lives.

AMED3003
Diagnostics and Biomarkers

Credit points: 6 **Teacher/Coordinator:** Dr Fabienne Brilot-Turville **Session:** Semester 2 **Classes:** interactive face to face 4 hrs/week; online activities 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, skill based assessments, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Diagnostic sciences have evolved at a rapid pace and provide the cornerstone of our health care system. Effective diagnostic assays enable the identification of people who have, or are at risk of, a disease, and guide their treatment. Research into the pathophysiology of disease underpins the discovery of novel biomarkers and in turn, the development of revolutionary diagnostic assays that make use of state-of-the-art molecular and cellular methods. In this unit you will explore a diverse range of diagnostic tests and gain valuable practical experience in a number of core diagnostic methodologies, many of which are currently used in hospital laboratories. Together we will also cover the regulatory, social, and ethical aspects of the use of biomarkers and diagnostic tests and explore the pathways to their translation into clinical practice. By undertaking this unit, you will develop your understanding of diagnostic assays and biomarkers and acquire the skills needed to embark on a career in diagnostic sciences.

AMED3004
Clinical Science

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Gold **Session:** Semester 2 **Classes:** interactive face to face 4 hrs/week; online activities 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, skill based assessment, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Clinical science is a multidisciplinary science that combines the principles of experimental science with translational medicine. As a clinical scientist, you will have the capacity to interpret test results, isolate causes of disease, and ultimately develop new treatments that will save lives. Clinical Science will provide you with the breadth and depth of knowledge and skills that will give you a broad foundation of knowledge and open up a range of career opportunities in clinical sciences, including medical research, pharmaceutical development and clinical diagnostics. You will learn the language of the clinical world as you develop expertise in literature searching, study design, data interrogation and interpretation, evidence-based decision-making, and current knowledge in medical research. You will explore how discoveries in the medical sciences are translated into clinical practice, and pose your own clinical questions for investigation. You will study important medical conditions from the areas of infectious and genetic diseases and immunity. The capstone experience of your study in Clinical Science will be a short internship in a sector of the clinical sciences of your interest, such as a diagnostic lab, a research lab or a clinical trials centre.

Minor core

AMED3004
Clinical Science

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Gold **Session:** Semester 2 **Classes:** interactive face to face 4 hrs/week; online activities 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, skill based assessment, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Clinical science is a multidisciplinary science that combines the principles of experimental science with translational medicine. As a clinical scientist, you will have the capacity to interpret test results, isolate causes of disease, and ultimately develop new treatments that will save lives. Clinical Science will provide you with the breadth and depth of knowledge and skills that will give you a broad foundation of knowledge and open up a range of career opportunities in clinical sciences, including medical research, pharmaceutical development and clinical diagnostics. You will learn the language of the clinical world as you develop expertise in literature searching, study design, data interrogation and interpretation, evidence-based decision-making, and current knowledge in medical research. You will explore how discoveries in the medical sciences are translated into clinical practice, and pose your own clinical questions for investigation. You will study important medical conditions from the areas of infectious and genetic diseases and immunity. The capstone experience of your study in Clinical Science will be a short internship in a sector of the clinical sciences of your interest, such as a diagnostic lab, a research lab or a clinical trials centre.

Minor selective

AMED3001
Cancer

Credit points: 6 **Teacher/Coordinator:** Assoc Prof Scott Byrne **Session:** Semester 1 **Classes:** interactive face to face activities 4 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, assignments, quiz, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

What does it mean when someone tells you: "you have cancer"? Initially you're probably consumed with questions like: "how did this happen?" and "will this cancer kill me?". In this unit, we will explore all aspects of the "cancer problem" from the underlying biomedical and environmental causes, through to emerging approaches to cancer diagnosis and treatment. You will integrate medical science knowledge from a diverse range of disciplines and apply this to the prevention, diagnosis and treatment of cancer both at the individual and community level. Together we will explore the epidemiology, aetiology and pathophysiology of cancer. You will be able to define problems and formulate solutions related to the study, prevention and treatment of cancer with consideration throughout for the economic, social and psychological costs of a disease that affects billions. Face-to-face and online learning activities will allow you to work effectively in individual and collaborative contexts. You will acquire the skills to interpret and communicate observations and experimental findings related to the "cancer problem" to diverse audiences. Upon completion, you will have developed the foundations that will allow you to follow a career in cancer research, clinical and diagnostic cancer services and/or the corporate system that supports the health care system.

Textbooks

Recommended Textbook: 1.,Weinberg (2013) The Biology of Cancer. 2nd edition. Garland Science Recommended reading: 1.,Hanahan and Weinberg (2000). The hallmarks of cancer. Cell 100, 57-70. 2.,Hanahan and Weinberg (2011). Hallmarks of cancer: the next generation. Cell 144, 646-74

AMED3002
Interrogating Biomedical and Health Data

Credit points: 6 **Teacher/Coordinator:** Prof Jean Yang **Session:** Semester 1 **Classes:** face to face 5 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assumed knowledge:** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. **Assessment:** in-semester exam, assignments, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Biotechnological advances have given rise to an explosion of original and shared public data relevant to human health. These data, including the monitoring of expression levels for thousands of genes and proteins simultaneously, together with multiple databases on biological systems, now promise exciting, ground-breaking discoveries in complex diseases. Critical to these discoveries will be our ability to unravel and extract information from these data. In this unit, you will develop analytical skills required to work with data obtained in the medical and diagnostic sciences. You will explore clinical data using powerful, state of the art methods and tools. Using real data sets, you will be guided in the application of modern data science techniques to interrogate, analyse and represent the data, both graphically and numerically. By analysing your own real data, as well as that from large public resources you will learn and apply the methods needed to find information on the relationship between genes and disease. Leveraging expertise from multiple sources by working in team-based collaborative learning environments, you will develop knowledge and skills that will enable you to play an active role in finding meaningful solutions to difficult problems, creating an important impact on our lives.

AMED3003
Diagnostics and Biomarkers

Credit points: 6 **Teacher/Coordinator:** Dr Fabienne Brilot-Turville **Session:** Semester 2 **Classes:** interactive face to face 4 hrs/week; online activities 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, skill based assessments, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Diagnostic sciences have evolved at a rapid pace and provide the cornerstone of our health care system. Effective diagnostic assays enable the identification of people who have, or are at risk of, a disease, and guide their treatment. Research into the pathophysiology of disease underpins the discovery of novel biomarkers and in turn, the development of revolutionary diagnostic assays that make use of state-of-the-art molecular and cellular methods. In this unit you will explore a diverse range of diagnostic tests and gain valuable practical experience in a number of core diagnostic methodologies, many of which are currently used in hospital laboratories. Together we will also cover the regulatory, social, and ethical aspects of the use of biomarkers and diagnostic tests and explore the pathways to their translation into clinical practice. By undertaking this unit, you will develop your understanding of diagnostic assays and biomarkers and acquire the skills needed to embark on a career in diagnostic sciences.

Behavioural Sciences

Behavioural Sciences is the scientific study of human behavior, psychology, and mental processes. It is concerned with the way we behave as individuals as well as in groups; it is concerned with the way we act as well as the way we think; and it is concerned with our interaction with the physical world as well as our interaction with others.

When you study Behavioural Sciences, you will cover a range of areas including behavioural neuroscience, personality theory, social influences on the behaviour of individuals and groups, forensic psychology, health psychology, developmental psychology, abnormal psychology, memory, attention, intelligence, sensory processes and perception, research methods, and theories of learning and motivation.

The School of Psychology is part of the Faculty of Science. Units of study in this major are available at standard level, except for PSYC2010 (available at advanced level in PSYC2910), and PSYC3011 (available at advanced level in PSYC3911), PSYC3013 (available at advanced level in PSYC3913), PSYC3014 (available at advanced level in PSYC3914) and PSYC3016 (available at advanced level in PSYC3916).

About the major

The Behavioural Sciences Major is designed for students who do not necessarily wish to train to become accredited psychologists. Rather, this is designed for students who wish to engage in higher degree research in one or more of the areas of psychological science and/or to complement their studies in another major where expertise in one of the research areas of psychological sciences would be beneficial.

Please note: Students who wish to undertake professional training at the postgraduate level to become registered psychologists must complete the full Psychology Program. The Behavioural Sciences major is not a pathway to professional accreditation as a Psychologist.

Requirements for completion

A major in requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)6 credit points of 2000-level core units
(iii)12 credit points of 2000-level selective units
(iv)18 credit points of 3000-level selective units

A minor in Behavioural Sciences is available and articulates to this major.

First year

Core: PSYC1001 and PSYC1002.

In the first year, you will be introduced to all the disciplines in Psychology, including behavioural neuroscience, personality theory, social influences on the behaviour of individuals and groups, forensic psychology, health psychology, developmental psychology, abnormal psychology, memory, attention, intelligence, sensory processes and perception, research methods, and theories of learning and motivation.

Second year

PSYC2012 and 12 credit points from: PSYC2X10 or PSYC2013 or PSYC2014.

All students will be trained in the core research and statistical methods used in the Behavioural Sciences, and may select to specialise in two other core research disciplines in the Behavioural Sciences: Brain and Behaviour (Learning and Motivation; Clinical Psychology; Perceptual Systems; Neuroscience); Cognitive and Social Psychology, or Personality and Differential Psychology.

The second year course provides the essential training in statistical methods and the disciplinary knowledge required to undertake research projects in the Behavioural Sciences in the Third year.

Third year

18 credit points from: PSYC3010, PSYC3X11, PSYC3012, PSYC3X13, PSYC3X14, PSYC3015, PSYC3X16, PSYC3017, PSYC3018, PSYC3020, HPSC3023.

The third year courses allow students to specialise in a few of the major research disciplines in Psychology.

Students must choose to take specialist courses in the areas of Learning and Behaviour, Perceptual Systems, Cognitive Psychology, Neuroscience, Developmental Psychology, Social Psychology, Differential Psychology, Applied Psychology (Forensic, Health, Organisational), Clinical Psychology, Advanced Statistics, or Theoretical Psychology.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
There is no dedicated Honours program for the Behavioural Sciences Major. Students who wish to do the Psychology honours program must complete the full Psychology Program.

Contact and further information

W sydney.edu.au/science/psychology/current_students/accred_psychology_major.shtml

Address:
School of Psychology
Griffith Taylor Building (A19)
The University of Sydney NSW 2006

Dr Ian Johnston
E I.Johnston@sydney.edu.au
T +61 2 9351 4353

Learning Outcomes

Students who graduate from Behavioural Sciences will be able to:

1. Describe in detail the major theories of the core disciplines in the Psychological Sciences: Learning and Behaviour, Perceptual Systems, Cognitive Psychology, Neuroscience, Developmental Psychology, Social Psychology, Differential Psychology, Applied Psychology (Forensic, Health, Organisational), Clinical Psychology, Research Methods and Statistics, and Theoretical Psychology.
2. Understand, apply, and evaluate basic research methods in Psychology, including research design, data analysis and interpretation, and the appropriate use of technologies.
3. Apply these concepts to personal, social, and professional issues.
4. Design, conduct, and interpret experimental research in psychology
5. Apply critical and creative thinking, skeptical inquiry, and the scientific approach to solve problems related to Psychology
6. Value empirical evidence; act ethically and professionally; and understand the complexity of sociocultural and international diversity
7. Evaluate and communicate the findings of research and literature through scientific research report, essays, orally, and in other media

Behavioural Sciences

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BEHAVIOURAL SCIENCES			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Behavioural Sciences major			
A major in Behavioural Sciences requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 6 credit points of 2000-level core units (iii) 12 credit points of 2000-level selective units (iv) 18 credit points of 3000-level selective units			
Behavioural Sciences minor			
A minor in Behavioural Sciences requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level selective units (iii) 12 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
PSYC1001 **Psychology 1001**	6		Intensive June Semester 1 Summer Main
PSYC1002 **Psychology 1002**	6	*This unit is also offered in the Sydney Summer School. For more information consult the web site: http://sydney.edu.au/summer/*	Semester 2 Summer Main
2000-level units of study			
Major core			
PSYC2012 **Statistics and Research Methods for Psych**	6	**A** Recommended: HSC Mathematics, any level **P** PSYC1001 OR PSYC1002	Semester 1
Major selective			
PSYC2010 **Brain and Behaviour**	6	**P** PSYC1002 **N** PSYC2011, PSYC2911, PSYC2910	Semester 1
PSYC2910 **Brain and Behaviour (Advanced)**	6	**P** A mark of at least 75 in PSYC1002 **N** PSYC2011, PSYC2911, PSYC2010	Semester 1
PSYC2013 **Cognitive and Social Psychology**	6	**P** PSYC1001 and PSYC1002	Semester 2
PSYC2014 **Personality and Psychology Assessment 1**	6	**P** PSYC1001 and PSYC1002	Semester 2
Minor selective			
PSYC2010 **Brain and Behaviour**	6	**P** PSYC1002 **N** PSYC2011, PSYC2911, PSYC2910	Semester 1
PSYC2910 **Brain and Behaviour (Advanced)**	6	**P** A mark of at least 75 in PSYC1002 **N** PSYC2011, PSYC2911, PSYC2010	Semester 1
PSYC2012 **Statistics and Research Methods for Psych**	6	**A** Recommended: HSC Mathematics, any level **P** PSYC1001 OR PSYC1002	Semester 1
PSYC2013 **Cognitive and Social Psychology**	6	**P** PSYC1001 and PSYC1002	Semester 2
PSYC2014 **Personality and Psychology Assessment 1**	6	**P** PSYC1001 and PSYC1002	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
3000-level units of study			
Selective			
PSYC3010 **Advanced Statistics for Psychology**	6	**P** PSYC2012 plus at least one other Intermediate Psychology Unit of Study from PSYC2010, PSYC2910, PSYC2011, PSYC2911, PSYC2013, PSYC2014	Semester 2
PSYC3011 **Learning and Behaviour**	6	**P** (PSYC2011 or PSYC2911 or PSYC2010 or PSYC2910) and PSYC2012 **N** PSYC3911	Semester 1
PSYC3911 **Learning and Behaviour (Advanced)**	6	**P** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **N** PSYC3011	Semester 1
PSYC3012 **Cognition, Language and Thought**	6	**P** PSYC2012 and PSYC2013	Semester 1
PSYC3013 **Perceptual Systems**	6	**P** (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and PSYC2012 **N** PSYC3913	Semester 2
PSYC3913 **Perceptual Systems (Advanced)**	6	**P** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **N** PSYC3013	Semester 2
PSYC3014 **Behavioural and Cognitive Neuroscience**	6	**P** [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **N** PSYC3914	Semester 2
PSYC3914 **Behavioural and Cognitive Neuroscience Adv**	6	**P** [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **N** PSYC3014	Semester 2
PSYC3015 **Personality and Psychology Assessment 2**	6	**P** PSYC2012 and PSYC2014	Semester 1
PSYC3016 **Developmental Psychology**	6	**P** PSYC2012 and PSYC2013 **N** PSYC3916	Semester 2
PSYC3916 **Developmental Psychology (Advanced)**	6	**P** (A mark of 75 or above in PSYC2013) and PSYC2012 **N** PSYC3016	Semester 2
PSYC3017 **Social Psychology**	6	**P** PSYC2013	Semester 1
PSYC3018 **Abnormal Psychology**	6	**P** (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and PSYC2014	Semester 1
PSYC3020 **Applied Psychology**	6	**P** 12 credit points of junior psychology and 12 credit points in Intermediate Psychology **N** PSYC3019	Semester 2
HPSC3023 **Psychology and Psychiatry: History and Phil**	6	**A** HPSC2100 and HPSC2101 **P** (12 credit points of Intermediate HPSC units) OR (Credit or greater in an HPSC Intermediate unit) OR (12 Intermediate credit points in Psychology units)	Semester 1

Behavioural Sciences

BEHAVIOURAL SCIENCES

Advanced coursework and projects will be available in 2020 for students who complete this major.

Behavioural Sciences major

A major in Behavioural Sciences requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 6 credit points of 2000-level core units(iii) 12 credit points of 2000-level selective units(iv) 18 credit points of 3000-level selective units

Behavioural Sciences minor

A minor in Behavioural Sciences requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level selective units(iii) 12 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

PSYC1001
Psychology 1001

Credit points: 6 **Session:** Intensive June, Semester 1, Summer Main **Classes:** Three 1 hour lectures and one 1 hour tutorial per week, plus 1 hour per week of additional web-based (self-paced) material related to the tutorial. **Assessment:** One 2.5hr exam, one 1000 word research report, multiple tutorial tests, experimental participation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Psychology 1001 is a general introduction to the main topics and methods of psychology, and is the basis for advanced work as well as being of use to those not proceeding with the subject. Psychology 1001 covers the following areas: science and statistics in psychology; applied psychology; themes in the history of psychology; social psychology; personality theory; human development. This unit is also offered in the Sydney Summer School. For more information consult the web site: http://sydney.edu.au/summer_school/

Textbooks
Available on-line once semester commences

PSYC1002
Psychology 1002

Credit points: 6 **Session:** Semester 2, Summer Main **Classes:** Three 1 hour lectures and one 1 hour tutorial per week, plus 1 hour per week of additional web-based (self-paced) material related to the tutorial. **Assessment:** One 2.5hr exam, one 1000 word research report, multiple tutorial tests, experimental participation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is also offered in the Sydney Summer School. For more information consult the web site: http://sydney.edu.au/summer/

Psychology 1002 is a further general introduction to the main topics and methods of psychology, and it is the basis for advanced work as well as being of use to those not proceeding with the subject. Psychology 1002 covers the following areas: neuroscience; human mental abilities; learning and motivation; visual perception; cognitive processes; abnormal psychology.

This unit is also offered in the Sydney Summer School. For more information consult the web site:

http://sydney.edu.au/summer_school/

Textbooks
Available on-line once semester commences

2000-level units of study

Major core

PSYC2012
Statistics and Research Methods for Psych

Credit points: 6 **Session:** Semester 1 **Classes:** 3 x 1 hour lectures per week for 6 weeks (even weeks) and 2 x 1 hour lectures per week for the remaining 7 weeks (odd weeks); 2 hour tutorial per week **Prerequisites:** PSYC1001 OR PSYC1002 **Assumed knowledge:** Recommended: HSC Mathematics, any level **Assessment:** One 2 hour final exam plus a combination of in class tests, midsemester exam, and/or a written assignment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim is to introduce students to fundamental concepts in statistics as applied to psychological research. These include summary descriptive statistics, an introduction to the principles and practice of research design, and the use of inferential statistics. Building upon this framework, the unit of study aims to develop each student's expertise in understanding the rationale for, and application of, a variety of statistical tests to the sorts of data typically obtained in psychological research.

Major selective

PSYC2010
Brain and Behaviour

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2910 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study examines a range of phenomena and principles in behaviour, learning and perception, abnormal psychology and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes are designed for students with an interest in clinical and therapeutic Psychology, and will allow students to design and implement a behaviour modification programme.

Textbooks
Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.
Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2910
Brain and Behaviour (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Ian Johnston **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** A mark of at least 75 in PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2010 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study focuses on the Behavioural Sciences, Neurosciences, Abnormal Psychology and the study of perception. The lecture content is the same as PSYC2011, and examines a range of phenomena and principles in behaviour, learning and perception, and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes differ from PSYC2011, as it is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. Students will gain hands-on laboratory experience in how the principles and phenomena of behavioural neuroscience may be studied experimentally.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.

Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2013
Cognitive and Social Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** PSYC1001 and PSYC1002 **Assessment:** One 2 hour exam, major assignment (1500-2000 word essay/report), minor assignment (short written practical exercise and/or tutorial quiz) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit expands the depth and range of topics introduced in the first year lectures on Cognitive Processes, Social Psychology and Developmental Psychology. The section on Cognitive Processes focuses on current theories of memory, attention, and reasoning and discusses the methods and issues involved in investigating these processes in both healthy individuals and people with cognitive dysfunctions. The second section on Social Psychology examines salient social constructs such as impression management, and prejudice, and explores how mental processes affect social judgment and behaviour. The final section on Developmental Psychology presents and evaluates evidence about the early influences on children's social and cognitive development.

PSYC2014
Personality and Psychology Assessment 1

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** PSYC1001 and PSYC1002 **Assessment:** One 2 hour exam, major assignment (1500-2000 word essay/report), minor assignment (short written practical exercise and/or tutorial quizzes and/or class presentation) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The main aim of this course is to introduce students to a number of influential theories in personality and intelligence. Students will be exposed to some conceptual analysis and will be expected to gain an understanding and be able to examine critically the various theories covered. Furthermore, students will be introduced to key topics in the scientific study and assessment of individual differences (Psychometrics) in personality and intelligence. The course will cover both conceptual (e.g. validity and reliability) and applied (e.g. Factor Analysis) elements of statistical psychometric inference.

Minor selective

PSYC2010
Brain and Behaviour

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2910 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study examines a range of phenomena and principles in behaviour, learning and perception, abnormal psychology and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes are designed for students with an interest in clinical and therapeutic Psychology, and will allow students to design and implement a behaviour modification programme.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.

Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2910
Brain and Behaviour (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Ian Johnston **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** A mark of at least 75 in PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2010 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study focuses on the Behavioural Sciences, Neurosciences, Abnormal Psychology and the study of perception. The lecture content is the same as PSYC2011, and examines a range of phenomena and principles in behaviour, learning and perception, and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes differ from PSYC2011, as it is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. Students will gain hands-on laboratory experience in how the principles and phenomena of behavioural neuroscience may be studied experimentally.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.

Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2012
Statistics and Research Methods for Psych

Credit points: 6 **Session:** Semester 1 **Classes:** 3 x 1 hour lectures per week for 6 weeks (even weeks) and 2 x 1 hour lectures per week for the remaining 7 weeks (odd weeks); 2 hour tutorial per week **Prerequisites:** PSYC1001 OR PSYC1002 **Assumed knowledge:** Recommended: HSC Mathematics, any level **Assessment:** One 2 hour final exam plus a combination of in class tests, midsemester exam, and/or a written assignment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim is to introduce students to fundamental concepts in statistics as applied to psychological research. These include summary descriptive statistics, an introduction to the principles and practice of research design, and the use of inferential statistics. Building upon this framework, the unit of study aims to develop each student's expertise in understanding the rationale for, and application of, a variety of statistical tests to the sorts of data typically obtained in psychological research.

PSYC2013
Cognitive and Social Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** PSYC1001 and PSYC1002 **Assessment:** One 2 hour exam, major assignment (1500-2000 word essay/report), minor assignment (short written practical exercise and/or tutorial quiz) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit expands the depth and range of topics introduced in the first year lectures on Cognitive Processes, Social Psychology and Developmental Psychology. The section on Cognitive Processes focuses on current theories of memory, attention, and reasoning and discusses the methods and issues involved in investigating these processes in both healthy individuals and people with cognitive dysfunctions. The second section on Social Psychology examines salient social constructs such as impression management, and prejudice, and explores how mental processes affect social judgment and behaviour. The final section on Developmental Psychology presents and evaluates evidence about the early influences on children's social and cognitive development.

PSYC2014
Personality and Psychology Assessment 1

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** PSYC1001 and PSYC1002 **Assessment:** One 2 hour exam, major assignment (1500-2000 word essay/report), minor assignment (short written practical exercise and/or tutorial quizzes and/or class presentation) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The main aim of this course is to introduce students to a number of influential theories in personality and intelligence. Students will be exposed to some conceptual analysis and will be expected to gain an understanding and be able to examine critically the various theories covered. Furthermore, students will be introduced to key topics in the scientific study and assessment of individual differences (Psychometrics) in personality and intelligence. The course will cover both conceptual (e.g. validity and reliability) and applied (e.g. Factor Analysis) elements of statistical psychometric inference.

3000-level units of study

Selective

PSYC3010
Advanced Statistics for Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** PSYC2012 plus at least one other Intermediate Psychology Unit of Study from PSYC2010, PSYC2910, PSYC2011, PSYC2911, PSYC2013, PSYC2014 **Assessment:** One 2 hour exam, class tests, practical exercises (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study expands upon students' knowledge of the general linear model and its applications in the analysis of data from psychological research. The first half focuses on multiple regression and its extensions, which are used when the primary interest is to predict or explain a particular variable based on a set of other variables. The second half of the course introduces students to contrast analysis as an extension of ANOVA, which allows for more focused analysis of data where group comparisons are the primary interest.

Textbooks

Keith, Z. T. (2006). Multiple Regression and Beyond. New York: Pearson Education, Inc.

PSYC3011
Learning and Behaviour

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** (PSYC2011 or PSYC2911 or PSYC2010 or PSYC2910) and PSYC2012 **Prohibitions:** PSYC3911 **Assessment:** One 2 hour exam, one 2000 word prac report, tutorial quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit addresses the fundamental concepts and more important research findings related to contemporary theories of associative learning in animals and humans. It examines the application of such fundamental research to issues such as drug use and food choice. It is designed to foster skills in reading primary sources in this area, and provide the opportunity for hands-on experience in carrying out a research project.

Textbooks

Bouton, M. E. (2016). Learning and Behavior: A contemporary synthesis, 2nd edition. Sunderland, MA: Sinauer.

PSYC3911
Learning and Behaviour (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** 2x 1-hr lectures and 1x 2-hr tutorial per week **Prerequisites:** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **Prohibitions:** PSYC3011 **Assessment:** One 2 hour exam, one 2500 word prac report, tutorial quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit addresses the fundamental concepts and more important research findings related to contemporary theories of associative learning in animals and humans. It examines the application of such fundamental research to issues such as drug use and food choice. It is designed to foster skills in reading primary sources in this area, and provide the opportunity for hands-on experience in carrying out a research project. In the advanced unit of study students will learn techniques to model learning and behaviour, and independently apply these skills to experimental data that they have collected.

Textbooks

Bouton, M. E. (2016). Learning and Behavior: A contemporary synthesis, 2nd edition. Sunderland, MA: Sinauer.

PSYC3012
Cognition, Language and Thought

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour practical per week. **Prerequisites:** PSYC2012 and PSYC2013 **Assessment:** One 2 hour exam, 2000 word practical report, practical exercise(s) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit extends the theories and methods of investigating memory and attentional processes discussed in PSYC2013 to consider a number of domains of higher cognitive processing. One strand of the course will focus on the cognitive processes involved in speech perception, language comprehension, language production, and reading. The remainder of the course will deal with the cognitive processes involved in reasoning and skill acquisition. The practical program will expose students to a variety of the research methods used to investigate higher cognitive processes, develop their understanding of how these methods can be used to investigate hypotheses about mental processes and consider applications of cognitive research to real-world problems and issues.

PSYC3013
Perceptual Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 2-hour tutorial per week. **Prerequisites:** (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and PSYC2012 **Prohibitions:** PSYC3913 **Assessment:** One 2-hour exam, one 2000 word report, tutorial quiz, group presentation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Perception poses many challenges: how do we see colour and movement? How do we perceive surfaces and materials? How does combining information from multiple senses improve our perception? This unit draws on behavioural and neurophysiological perspectives to deepen understanding of current research topics in perception. The emphasis is on how visual information is processed to accomplish functions such as perceiving a single edge, extracting the contours that form a face, or the spatial relations needed to call offside on the sports field. Students also gain conceptual tools for evaluating the empirical and theoretical worth of recent research in perception. During the tutorial component of the course students will develop a practical experiment in which they formulate and test a hypothesis. In this way students gain important research experience that gives them valuable insight into the scientific process as it exists both in professional work and in the empirical research project required for the Honours degree.

Textbooks

Sensation and Perception, Third Edition
Jeremy M. Wolfe, Keith R. Kluender, Dennis M. Levi, Linda M. Bartoshuk,Rachel S. Herz, Roberta L. Klatzky, Susan J. Lederman, and Daniel M.Merfeld

PSYC3913
Perceptual Systems (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** 2x 1-hr lectures and 1x 2-hr tutorial per week **Prerequisites:** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **Prohibitions:** PSYC3013 **Assessment:** One 2-hour exam, one 2000 word report, laboratory participation, group presentation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Perception poses many challenges: how do we see colour and movement? How do we perceive surfaces and materials? How does combining information from multiple senses improve our perception? This unit draws on behavioural and neurophysiological perspectives to deepen understanding of current research topics in perception. The emphasis is on how visual information is processed to accomplish functions such as perceiving a single edge, extracting the contours that form a face, or the spatial relations needed to call offside on the sports field. Students also gain conceptual tools for evaluating the empirical and theoretical worth of recent research in perception. During the tutorial component of the course students will develop a practical experiment in which they formulate and test a hypothesis. In this way students gain important research experience that gives them valuable insight into the scientific process as it exists both in professional work and in the empirical research project required for the Honours degree. In the advanced unit of study students will be placed in laboratories and will learn research techniques while helping conduct experiments in these laboratories.

Textbooks

Sensation and Perception, Third Edition

PSYC3014
Behavioural and Cognitive Neuroscience

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour practical per week. **Prerequisites:** [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **Prohibitions:** PSYC3914 **Assessment:** One 2 hour exam, one major essay/report 2000-2500 words, tutorial quizzes and participation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on approaches to studying neurosciences incorporating molecular, pre-clinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. The implications of focal cognitive deficits in neurological patients for models of normal cognitive function will also be explored. Specific topics to be covered will be selected from the following areas: sensorimotor integration and the neural and molecular basis of learning and memory, attention, language, visual cognition and praxis. In addition to lectures, a practical component will cover basic neuroanatomy and neuroscientific methods. The practical component will also introduce students to experimental and neuropsychological approaches to studying the relationahip between brain and behaviour.

PSYC3914
Behavioural and Cognitive Neuroscience Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Two lectures, one 1 hour tutorial and one 2 hour practical per week. **Prerequisites:** [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **Prohibitions:** PSYC3014 **Assessment:** One 2 hour exam (end of semester), one quiz (mid-semester), one presentation, one written assignment (lab report), attendance and participation in tutorial/practical exercises (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on approaches to studying neurosciences incorporating molecular, pre-clinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. Specific topics to be covered will be selected from the following areas: sensorimotor integration, and the neural and molecular basis of learning and memory, attention, language, visual cognition and praxis. The lecture material will be the same as for PSYC3014, however, the practical class is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. The practical component of the advanced stream will cover basic neuroanatomy, histology and neuropharmacology and will introduce students to experimental approaches to studying brain-behaviour relationships.

PSYC3015
Personality and Psychology Assessment 2

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** PSYC2012 and PSYC2014 **Assessment:** One 2 hour exam; one 2000-2500 word major essay/report, and in-class activities (e.g., tutorial presentations, in-class quizzes) (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study addresses current issues in personality, psychological testing, intelligence, and individual differences. Students are introduced to different theoretical models used in personality, intelligence, emotional intelligence, and metacognition and expected to critically evaluate these theories based on the supporting research evidence. This unit also presents different psychological testing techniques and methods.

PSYC3016
Developmental Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** PSYC2012 and PSYC2013 **Prohibitions:** PSYC3916 **Assessment:** One 2 hour exam, 2000 word prac report, practical exercise(s) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines our understanding of human psychological development, focusing on selected issues and empirical traditions within the discipline of Developmental Psychology. Students are expected to gain an understanding of the theoretical influences that have come to dominate developmental research, and students will also be introduced to a range of theoretical and research approaches in contemporary Developmental Science. These include: sense of identity, conceptual development, children's thinking, social cognition, moral reasoning and behaviour, and the role of genetic and environmental influences on development. The course will also consider applications of developmental research and theory in developmental psychopathology and in educational contexts, as well as exploring children's experience of art, literature and drama. Students are expected to gain knowledge of, and develop a critical approach to, the analysis of current research and theoretical issues in these areas.

PSYC3916
Developmental Psychology (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** 2x 1-hr lectures and 1x 2-hr tutorial per week **Prerequisites:** (A mark of 75 or above in PSYC2013) and PSYC2012 **Prohibitions:** PSYC3016 **Assessment:** one 2 hour exam, 2000 word prac report, practical exercise(s) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines our understanding of human psychological development, focusing on selected issues and empirical traditions within the discipline of Developmental Psychology. Students are expected to gain an understanding of the theoretical influences that have come to dominate developmental research, and students will also be introduced to a range of theoretical and research approaches in contemporary Developmental Science. These include: sense of identity and self-worth, conceptual development, children's thinking, social cognition, moral reasoning and behaviour, and the role of genetic and environmental influences on development. The course will also consider applications of developmental research and theory in developmental psychopathology and in educational contexts, as well as exploring children's experience of art, literature and drama. Students are expected to gain knowledge of, and develop a critical approach to, the analysis of current research and theoretical issues in these areas. In the advanced unit of study students will collect, score, and analyse the data from children participating in research projects in the School's Developmental Laboratories.

PSYC3017
Social Psychology

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 2-hour tutorial per most weeks. **Prerequisites:** PSYC2013 **Assessment:** One 2-hour exam, one 2500 word research report (consisting of both group work and individually-written components), and tutorial presentation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit continues the coverage of topics in Social Psychology begun in PSYC1001 and PSYC2013. The unit is divided into topic areas, where the emphasis is on evaluating theories and the relevant evidence. Topics areas include among others: antisocial behaviours, discrimination, the self, emotion, cultural psychology, evolutionary psychology, and existential social psychology. Tutorials provide first-hand experience of research by involving students in a small group research project based on topics covered in the lectures. The tutorials also provide an opportunity to discuss issues pertaining to each step of the research process (e.g., ethical issues that underlie social psychological research, proper practice when collecting and handling data, how to communicate research findings in written and verbal form).

PSYC3018
Abnormal Psychology

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and PSYC2014 **Assessment:** One 2 hour exam, one 2000 word essay, quiz, and tutorial presentation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study critically examines core issues in abnormal psychology, concerning the description, explanation and treatment of psychological disorders. The unit of study will include topics such as:

(a) Adult abnormal psychology: Anxiety and related disorders (specific phobias, panic disorder, generalised anxiety disorder, OCD, PTSD); Substance-related and Addictive disorders (drug, alcohol, gambling); Eating disorders (anorexia nervosa, bulimia nervosa); Depressive disorders, Bipolar disorders; Schizophrenia, Personality disorders.

(b) Child abnormal psychology: Attention Deficit Hyperactivity Disorder; Conduct disorder; Anxiety disorders, Depression.

Textbooks

Rieger, E. (Ed.) (2014) Abnormal Psychology: Leading researcher perspectives. Sydney: McGraw-Hill Education. (3rd Ed).

PSYC3020
Applied Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week **Prerequisites:** 12 credit points of junior psychology and 12 credit points in Intermediate Psychology **Prohibitions:** PSYC3019 **Assessment:** One 2 hour examination (50%), one 2500 word written assignment (30%), class quizzes (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to introduce students to various ways in which psychological theory and research can be applied in the real world. In particular, this unit will focus on Health Psychology, Forensic Psychology, and Organisational Psychology. The Health Psychology component of this course may include investigation into why we engage in risky health behaviours including smoking, overeating and alcohol use; inequalities in health including Aboriginal and Torres Strait Island health; dealing with chronic illness including death and dying, and survivorship. The Forensic Psychology component of the course may include investigation into lie detection, criminal offenders, victims of crime, and eyewitness memory. The Organisational Psychology component of the course may focus on personnel selection, training in organisations, performance measurement, workplace motivation, leadership and aspects of positive psychology.

HPSC3023
Psychology and Psychiatry: History and Phil

Credit points: 6 **Teacher/Coordinator:** A/Prof Hans Pols and Dr Fiona Hibberd **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** (12 credit points of Intermediate HPSC units) OR (Credit or greater in an HPSC Intermediate unit) OR (12 Intermediate credit points in Psychology units) **Assumed knowledge:** HPSC2100 and HPSC2101 **Assessment:** 1x 2500wd essay (45%) and 1x2hr exam (45%) class participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Across the unit we examine one of the most interesting aspects of the history and philosophy of science. viz., the scientific practices and assumptions involved in making human beings an object of study. We will examine the ways in which psychologists and psychiatrists have investigated human nature, the kinds of experimental approaches they have developed to that end, the major controversies in this field, and the basic philosophical assumptions that have been made in the sciences of human nature. We investigate the developments of psychological theories and investigative methods as well as the development of psychiatric theory, treatment methods, and institutions.

Biochemistry and Molecular Biology

Study in Biochemistry and Molecular Biology is taught within the School of Life and Environmental Sciences in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

Students who complete a major in Biochemistry and Molecular Biology will gain a thorough understanding of the chemistry of life and the molecules that regulate living processes, with an emphasis on how these molecules pass information and energy within and between cells, and from generation to generation, and how these processes impact form and function. This major is ideally suited for students who wish to study fundamental molecular processes that underlie normal physiology and disease in all kingdoms of life.

Requirements for completion

A major in Biochemistry and Molecular Biology requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)18 credit points of 3000-level core units with project unit
(iv)6 credit points of 3000-level selective units

A minor in Biochemistry and Molecular Biology is available and articulates to this major.

First year

Core: CHEM1XX1 and BIOL1XX7.

Second year

Core: BCMB2X01 (Medical science students enrol in MEDS2003 instead) and BCMB2X02.

BCMB2X01/MEDS2003 will provide students with a solid foundation in molecular biology, human metabolism and metabolic biochemistry. BCMB2X02 will enable students to understand how communication, transport and response to stimuli is mediated by proteins and biomolecular interaction networks within cells.

Third year

BCHM3X81, BCHM3X71, BCMB3001 and 6 credit points from: BCHM3X72, BCHM3X92, BCHM3X82, PCOL3X12.

In your third year you must take at least one designated project unit. 3000-level units will focus on the molecular basis of key biological processes such as gene regulation, advanced metabolic biochemistry and causes of disease, as well as tools and techniques that can be harnessed to modulate these processes including protein engineering and inhibitor development.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Biochemistry and Molecular Biology: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9036 5417

Address:
Room 435, Molecular Bioscience Building G08
University of Sydney NSW 2006

Professor Jacqui Matthews
T +61 2 9351 6025
E jacqui.matthews@sydney.edu.au

Learning Outcomes

Students who graduate from Biochemistry and Molecular Biology will be able to:

1. Understand the basic chemical and physical principles governing the structure and function of biomolecules.
2. Understand how molecules regulate living processes.
3. Appreciate the relationships between biomolecules, cells and tissues in health and disease
4. Design a scientific experimental plan, including: development of hypotheses an aims, identification of controls, and choice of relevant measurable outcomes.
5. Understand the principles underlying and the applications of current techniques and model systems commonly used in biochemistry and molecular biology.
6. Acquire the technical expertise to use those techniques and carry out laboratory-based experiments in the molecular life sciences.
7. Collate, analyse and critically interpret data.
8. Carry out comprehensive literature searches and write a scientific review.
9. Critically evaluate the literature, ranging from popular science journalism to more in-depth research articles.
10. Solve biological, agricultural and medical problems using a molecular approach.
11. Communicate to the wider community the implications and impacts of the ever increasing number of breakthroughs and discoveries in the life and medical sciences that impact on modern life.
12. Appreciate ethics (from scientific record keeping and reporting to bioethics) and issues associated with safe working conditions (safe working procedures, risk assessments, evaluation of chemical safety).

Biochemistry and Molecular Biology

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
BIOCHEMISTRY AND MOLECULAR BIOLOGY Advanced coursework and projects will be available in 2020 for students who complete this major.			
Biochemistry and Molecular Biology major A major in Biochemistry and Molecular Biology requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units with project unit (iv) 6 credit points of 3000-level selective units			
Biochemistry and Molecular Biology minor A minor in Biochemistry and Molecular Biology requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 6 credit points of 3000-level selective units without project (iv) 6 credit points of 3000-level of minor project selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
BCMB2002 **Proteins in Cells**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2902	Semester 2
BCMB2902 **Proteins in Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2002	Semester 2
MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Major core with project units			
BCHM3081 **Mol Biology and Biochemistry-Proteins**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3981 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3981 **Mol Biology and Biochem-Proteins (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3081 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3071 **Molecular Biology and Biochemistry-Genes**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3971 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3971 **Molecular Biology and Biochem-Genes (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3071 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCMB3001 to be developed for offering in 2019.			
Major selective units			
BCHM3072 **Human Molecular Cell Biology**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3972 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3972 **Human Molecular Cell Biology (Advanced)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3072 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3092 **Proteomics and Functional Genomics**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3992 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3992 **Proteomics and Functional Genomics (Adv)**	6	**P** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3092 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3082 **Medical and Metabolic Biochemistry**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3982 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3982 **Medical and Metabolic Biochemistry (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3082	Semester 2
PCOL3012 **Drug Design and Development**	6	**P** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **N** PCOL3912	Semester 1
PCOL3912 **Drug Design and Development (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **N** PCOL3012	Semester 1
Minor selective without project			
BCHM3081 **Mol Biology and Biochemistry-Proteins**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3981 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BCHM3981 **Mol Biology and Biochem-Proteins (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3081 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3071 **Molecular Biology and Biochemistry-Genes**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3971 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3971 **Molecular Biology and Biochem-Genes (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3071 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
Minor selective units			
BCHM3081 **Mol Biology and Biochemistry-Proteins**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3981 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3981 **Mol Biology and Biochem-Proteins (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3081 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3071 **Molecular Biology and Biochemistry-Genes**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3971 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3971 **Molecular Biology and Biochem-Genes (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3071 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3072 **Human Molecular Cell Biology**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3972 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3972 **Human Molecular Cell Biology (Advanced)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3072 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3092 **Proteomics and Functional Genomics**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3992 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3992 **Proteomics and Functional Genomics (Adv)**	6	**P** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3092 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3082 **Medical and Metabolic Biochemistry**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3982 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3982 **Medical and Metabolic Biochemistry (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3082	Semester 2
PCOL3012 **Drug Design and Development**	6	**P** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **N** PCOL3912	Semester 1
PCOL3912 **Drug Design and Development (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **N** PCOL3012	Semester 1

Biology

Biological Science is offered by the School of Life and Environmental Sciences in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

Biology is the study of living organisms, whether single-celled or multi-cellular, as individuals or in groups, and their interaction with their environment and with each other. It is concerned with all levels of biological complexity from the molecular level through to cells and tissues, to organisms, their populations and the ecosystems of which they form part. Biologists seek to understand the structure and function of the living world. Biologists investigate how organisms access and use energy and the processes by which they develop and replicate. Evolution provides an overarching framework for understanding changes that have occurred in groups of organisms over time.

The major will initially cover fundamental concepts in biology, such as life, the structure and function of molecules, cells and organisms and processes including metabolism and respiration.

As a broad and interconnecting major, it is characterised by integrating 'biology' sub-disciplines which are distinguished by:

- their subject matter
- the scale of the subject matter
- the suite of tools used for investigation.

This major has been structured in this way because biology is now moving into a phase of rapid expansion and discovery that places biologists at the forefront of current scientific research.

Requirements for completion

A major in Biology requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)6 credit points of 200-level experimental design units
(iii)6 credit points of 2000-level taxonomy units
(iv)6 credit points of 2000-level breadth units
(v)6 credit points of 3000-level field units
(vi)12 credit points of 3000-level selective units

A minor in Biology and a minor in Plant Science are available and articulate to this major.

First year

Core: BIOL1XX6 and BIOL1XX7.

Second year

BIOL2X22 and 6 credit points from: BIOL2X30 or BIOL2X21, and 6 credit points from: ANAT2009, IMMU2101, GEGE2X01, MICR2X31, BIOL2X21, BIOL2X30, BIOL2032, BIOL2X29, BIOL2033, BIOL2031, IMMU2X11.

Third year

6 credit points from selective field work units, and 12 credit points from a large selection of Biology units.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework

The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Biology: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

Professor Pauline Ross
W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 9351 8097

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building (F07)
Eastern Avenue
The University of Sydney NSW 2006

Learning Outcomes

Students who graduate from Biology will be able to:

1. Demonstrate a coherent understanding of biology by articulating the methods of biology, and explaining why current biological knowledge is both contestable and testable through further inquiry.
2. Demonstrate a coherent understanding of biology by explaining the role and relevance of biology in society.
3. Recognise that biological knowledge has been acquired by curiosity and creativity, and demonstrate creativity in thinking and problem solving.
4. Recognise and appreciate the significant role of biodiversity in sustaining life on our planet.
5. Exhibit depth and breadth of biological knowledge by demonstrating well-developed understanding of identified core concepts in biology.
6. Exhibit depth and breadth of biological knowledge by demonstrating that these core concepts have interdisciplinary connections with other disciplines.
7. Gather, synthesise and critically evaluate information about biological phenomena from a range of sources.
8. Critically analyse observations of biological phenomena by creating and developing models and/or proposing and testing hypotheses.
9. Design and conduct field, laboratory based, or virtual biological experiments.
10. Select and apply practical and/or theoretical techniques.
11. Collect, accurately record, interpret, analyse, and draw conclusions from biological data.
12. Effectively synthesise and communicate biological results using a range of modes (including oral, written, and visual) for a variety of purposes and audiences.
13. Account for their own learning and biological work by being independent and self-directed learners.
14. Work effectively, responsibly and safely in individual and peer or team contexts.
15. Demonstrate knowledge of the regulatory frameworks and ethical principles relevant to their sub-disciplinary area within biology, and apply these in practice.

Biology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session

BIOLOGY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Biology major

A major in Biology requires 48 credit points from this table including:

(i) 12 credit points of 1000-level core units

(ii) 6 credit points of 2000-level experimental design units

(iii) 6 credit points of 2000-level taxonomy units

(iv) 6 credit points of 2000-level breadth units

(v) 6 credit points of 3000-level field units

(vi) 12 credit points of 3000-level selective units

Biology minor*

A minor in Biology requires 36 credit points from this table including:

(i) 12 credit points of 1000-level core units

(ii) 6 credit points of 2000-level experimental design units

(iii) 6 credit points of 2000-level taxonomy units

(iv) 6 credit points of 2000-level breadth units

(v) 6 credit points of 3000-selective units

*The Plant Sciences minor also articulates to the Biology major

Units of study

The units of study are listed below.

1000-level units of study

Core

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2

2000-level units of study

Experimental design units

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL2022 **Biology Experimental Design and Analysis**	6	**A** BIOL1XXX or MBLG1XXX **P** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **N** BIOL2922 or BIOL3006 or BIOL3906	Semester 2
BIOL2922 **Biol Experimental Design and Analysis Adv**	6	**A** BIOL1XXX or MBLG1XXX **P** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **N** BIOL2022 or BIOL3006 or BIOL3906	Semester 2

Taxonomy units

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL2030 **Botany**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **N** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2930	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL2930 **Botany (Advanced)**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **P** Annual average mark of at least 70 in previous year **N** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2030	Semester 1
BIOL2021 **Zoology**	6	**A** BIOL1XXX or MBLG1XXX **N** BIOL2921 or BIOL2011 or BIOL2911 or BIOL2012 or BIOL2912	Semester 1
BIOL2921 **Zoology (Advanced)**	6	**A** BIOL1XXX or MBLG1XXX **P** Annual average mark of at least 70 in previous year **N** BIOL2021 or BIOL2011 or BIOL2911 or BIOL2012 or BIOL2912	Semester 1
Breadth units			
ANAT2009 **Comparative Primate Anatomy**	6	**A** BIOL1XX3 OR BIOL1XX8 **N** ANAT2002	Semester 2
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
MICR2031 **Microbiology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **N** MICR2021 or MICR2921 or MICR2024 or MICR2931	Semester 1
MICR2931 **Microbiology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **P** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2021 or MICR2921 or MICR2024 or MICR2031	Semester 1
BIOL2021 **Zoology**	6	**A** BIOL1XXX or MBLG1XXX **N** BIOL2921 or BIOL2011 or BIOL2911 or BIOL2012 or BIOL2912	Semester 1
BIOL2921 **Zoology (Advanced)**	6	**A** BIOL1XXX or MBLG1XXX **P** Annual average mark of at least 70 in previous year **N** BIOL2021 or BIOL2011 or BIOL2911 or BIOL2012 or BIOL2912	Semester 1
BIOL2030 **Botany**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **N** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2930	Semester 1
BIOL2930 **Botany (Advanced)**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **P** Annual average mark of at least 70 in previous year **N** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2030	Semester 1
BIOL2032 **Australian Wildlife Biology**	6	**N** ANSC2005	Semester 2
BIOL2029 **Cells**	6	**P** BIOL1XX7 or MBLG1XXX **N** BIOL2016 or BIOL2916 or BIOL2929	Semester 1
BIOL2929 **Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) **N** BIOL2016 or BIOL2916 orBIOL2029	Semester 1
BIOL2033 **Entomology**	6	**N** ENTO2001	Semester 2
BIOL2031 **Plants and Environment**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **N** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2931	Semester 2
BIOL2931 **Plants and Environment (Advanced)**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **P** Annual average mark of at least 70 in previous year **N** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2031	Semester 2
IMMU2X11 to be deveoped for offering in 2019.			
3000-level units of study			
Field units			
BIOL3007 **Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3907	Semester 2
BIOL3907 **Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3007	Semester 2
BIOL3008 **Marine Field Ecology** *This unit of study is not available in 2018*	6	**P** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **N** BIOL3908 or BIOL2028 or BIOL2928 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive July

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL3908 **Marine Field Ecology (Advanced)** *This unit of study is not available in 2018*	6	**P** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **N** BIOL3008 or BIOL2028 or BIOL2928 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive July
BIOL3009 **Terrestrial Field Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3909 or BIOL2009 or BIOL2909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
BIOL3909 **Terrestrial Field Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3009 or BIOL2009 or BIOL2909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered. This unit is not offered from 2019.*	Intensive July
BIOL3010 **Tropical Wildlife Biology** *This unit of study is not available in 2018*	6	**P** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **N** BIOL3910 or BIOL2010 or BIOL2910 *Note: Department permission required for enrolment* *This unit runs in February. It cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2017, 2019) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive February
BIOL3910 **Tropical Wildlife Biology (Adv)** *This unit of study is not available in 2018*	6	**P** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **N** BIOL3010 or BIOL2010 or BIOL2910 *Note: Department permission required for enrolment* *This unit runs in February. It cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2017, 2019) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive February
BIOL3016 **Coral Reef Biology**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3916 or BIOL2020 or BIOL2920 or NTMP3001 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
BIOL3916 **Coral Reef Biology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3016 or BIOL2020 or BIOL2920 or NTMP3001 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
Major selective units			
BIOL3013 **Marine Biology**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3913	Semester 2
BIOL3913 **Marine Biology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3013	Semester 2
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1
BIOL3918 **Gene Technology and Genomics (Adv)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **N** BIOL3018	Semester 1
BIOL3026 **Developmental Genetics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **N** BIOL3926	Semester 2
BIOL3926 **Developmental Genetics (Advanced)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **N** BIOL3929 or BIOL3026	Semester 2
BIOL3045 **Animal Ecological Physiology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3945 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912	Semester 1
BIOL3945 **Animal Ecological Physiology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3045 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912	Semester 1
BIOL3046 **Animal Behaviour**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3946 or BIOL3025 or BIOL3925	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL3946 **Animal Behaviour (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3046 or BIOL3025 or BIOL3925 *Note: Department permission required for enrolment*	Semester 1
Minor selective units			
BIOL3007 **Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3907	Semester 2
BIOL3907 **Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3007	Semester 2
BIOL3013 **Marine Biology**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3913	Semester 2
BIOL3913 **Marine Biology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3013	Semester 2
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1
BIOL3918 **Gene Technology and Genomics (Adv)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **N** BIOL3018	Semester 1
BIOL3026 **Developmental Genetics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **N** BIOL3926	Semester 2
BIOL3926 **Developmental Genetics (Advanced)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **N** BIOL3929 or BIOL3026	Semester 2
BIOL3045 **Animal Ecological Physiology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3945 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912	Semester 1
BIOL3945 **Animal Ecological Physiology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3045 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912	Semester 1
BIOL3046 **Animal Behaviour**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3946 or BIOL3025 or BIOL3925	Semester 1
BIOL3946 **Animal Behaviour (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3046 or BIOL3025 or BIOL3925 *Note: Department permission required for enrolment*	Semester 1

BIOL3029, BIOL3033, BIOL3020 to be developed for offering in 2019.

Plant Science Minor

A minor in Plant Science requires 36 credit points from this table including:

(i) 12 credit points of 1000-level core units

(ii) 12 credit points of 2000-level core units

(iii) 6 credit points of 3000-level core units

(iv) 6 credit points of 3000-level selective units

Units of Study

The units of study are listed below.

1000-level units of study

Core

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
2000-level units of study			
Core			
BIOL2030 **Botany**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **N** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2930	Semester 1
BIOL2930 **Botany (Advanced)**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **P** Annual average mark of at least 70 in previous year **N** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2030	Semester 1
BIOL2031 **Plants and Environment**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **N** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2931	Semester 2
BIOL2931 **Plants and Environment (Advanced)**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **P** Annual average mark of at least 70 in previous year **N** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2031	Semester 2
3000-level units of study			
Core			
BOL3020 to be developed for offering in 2019.			
Selective			
BIOL3009 **Terrestrial Field Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3909 or BIOL2009 or BIOL2909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
BIOL3909 **Terrestrial Field Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3009 or BIOL2009 or BIOL2909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.* *This unit is not offered from 2019.*	Intensive July
BIOL3029 to be developed for offering in 2019.			

Biology

BIOLOGY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Biology major

A major in Biology requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 6 credit points of 2000-level experimental design units (iii) 6 credit points of 2000-level taxonomy units (iv) 6 credit points of 2000-level breadth units (v) 6 credit points of 3000-level field units(vi) 12 credit points of 3000-level selective units

Biology minor*

A minor in Biology requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 6 credit points of 2000-level experimental design units (iii) 6 credit points of 2000-level taxonomy units (iv) 6 credit points of 2000-level breadth units (v) 6 credit points of 3000-selective units *The Plant Sciences minor also articulates to the Biology major

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed**

knowledge: HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

2000-level units of study

Experimental design units

BIOL2022
Biology Experimental Design and Analysis

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **Prohibitions:** BIOL2922 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides foundational skills essential for doing research in biology and for critically judging the research of others. We consider how biology is practiced as a quantitative, experimental and theoretical science. We focus on the underlying principles and practical skills you need to explore questions and test hypotheses, particularly where background variation (error) is inherently high. In so doing, the unit provides you with an understanding of how biological research is designed, analysed and interpreted using statistics. Lectures focus on sound experimental and statistical principles, using examples in ecology and other fields of biology to demonstrate concepts. In the practical sessions, you will design and perform, analyse (using appropriate statistical tools) and interpret your own experiments to answer research questions in topics relevant to your particular interest. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks
Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and M. J. Keough. 2002. Experimental Design and Data Analysis for Biologists. 1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2922
Biol Experimental Design and Analysis Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **Prohibitions:** BIOL2022 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2922 will be based on BIOL2022 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and Keough, 2002. Experimental Design and Data Analysis for Biologists.1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

Taxonomy units

BIOL2030
Botany

Credit points: 6 **Teacher/Coordinator:** A/Prof Rosanne Quinnell **Session:** Semester 1 **Classes:** Two 1-hour lecture/week; one 3-hour practical/week; a series of five 1-hour tutorial/week in the latter part of the semester **Prohibitions:** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2930 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quizzes (15%), anatomy project report and presentation (20%), practical exam (30%), theory exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are surrounded by plants, and rely on them every day for our wellbeing. Ecologists use botanical knowledge to help manage marine and terrestrial ecosystems, and public health and land management professionals depend on their understanding of plant science to help solve environmental problems and to enhance biosecurity. Botany aims to increase and improve our supply of medicines, foods, and other plant products, and is critical for anyone interested in contributing to the sustainable future of our planet. In this unit, you will explore the origins, diversity, and global significance of plants. You will gain insights into the micro- and macro-evolutionary processes and patterns behind how plants moved from aquatic ecosystems to terrestrial ecosystems. Integrated lectures, practical classes, and extensive online resources will allow you to develop and integrate practical skills and conceptual frame works in plant identification, plant physiology, plant anatomy, and plant morphology. Lectures and practical classes are augmented by self-instructional audio-visual sessions and by small group discussions to foster a sense of self-reliance and collaboration. Successful completion of BIOL2023 will allow you to contribute to a range of disciplines including: ecology, bioinformatics, molecular and cell biology, genetics and biotechnology, environmental law, agriculture, education and the arts.

Textbooks

Evert RF and Eichhorn SE. 2013. Raven: Biology of Plants. 8th Ed. Freeman and Co Publishers. New York. NY.
**School of Life and Env Sci. 201x. Botany and Botany Adv Study guide.
Additional reading:
Attwell BJ, Kriedeman PE, Turnbull CGN. 1999. Plants In Action. Macmillan, South Yarra. (Australian Plant Biology with a good section on ecophysiology).
Judd WS, Campbell CS, Kellogg EA, Stephens PF. 2007. Plant Systematics: a phylogenetic approach. 3rd Ed. Sinauer Associates Inc Massachusetts USA
Pellow B, Henwood M, Carolin R.C., 2009. Flora of the Sydney Region. 5th edition. Sydney University Press.
Simpson, MG. 2010. Plant Systematics Ed 2 Academic press (or Ed 1 2006)
Taiz L. Zeiger E. 2010. Plant Physiology. 5th Ed Sinauer. Sunderland, Mass.
Online learning resources:
Â¿LMS (currently BlackBoard)
Â¿BotanyOnline: http://botany.sydneybiology.org/

BIOL2930
Botany (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Rosanne Quinnell **Session:** Semester 1 **Classes:** Two 1-hour lectures/week; one 3-hour practical/week; a series of five 1-hour tutorial/week in the latter part of the semester **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2030 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quizzes (15%), advanced project report (20%), practical exam (30%), theory exam (35%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are surrounded by plants, and rely on them every day for our wellbeing. Ecologists use botanical knowledge to help manage marine and terrestrial ecosystems, and public health and land management professionals depend on their understanding of plant science to help solve environmental problems and to inform biosecurity. Botany aims to increase and improve our supply of medicines, foods, and other plant products, and is critical for anyone interested in contributing to the sustainable future of our planet. In this unit, you will explore the origins, diversity, and global significance of plants. You will gain insights into the micro- and macro-evolutionary processes and patterns behind how plants moved from aquatic ecosystems to terrestrial ecosystems. Integrated lectures, practical classes and extensive online resources will allow you to develop and integrate practical skills and conceptual frameworks in plant identification, and plant physiology, morphology and anatomy. Lectures and practical classes are augmented by discussions to foster a sense of self-reliance and collaboration. The Advanced Botany unit of study requires engagement at a high standard of academic rigour and affords opportunities to engage with core aspect of Botany at depth and to create new knowledge. In partnership with academic staff advanced students will undertake an independent research project, which will develop skills in research and communication.

Textbooks

Attwell BJ, Kriedeman PE, Turnbull CGN. 1999. Plants In Action. Macmillan, South Yarra. (Australian Plant Biology with a good section on ecophysiology).
Judd WS, Campbell CS, Kellogg EA, Stephens PF. 2007. Plant Systematics: a phylogenetic approach. 3rd Ed. Sinauer Associates Inc Massachusetts USA
Pellow B, Henwood M, Carolin R.C., 2009. Flora of the Sydney Region. 5th edition. Sydney University Press.
Simpson, MG. 2010. Plant Systematics Ed 2 Academic press (or Ed 1 2006)
Taiz L. Zeiger E. 2010. Plant Physiology. 5th Ed Sinauer. Sunderland, Mass.
**Essential.
Online learning resources:
Â¿LMS (currently BlackBoard)
Â¿BotanyOnline: http://botany.sydneybiology.org/

BIOL2021
Zoology

Credit points: 6 **Teacher/Coordinator:** A/Prof Mathew Crowther **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prohibitions:** BIOL2921 or BIOL2011 or BIOL2911 or BIOL2012 or BIOL2912 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** One 2-hour theory exam (50%), Lab book (15%), Invertebrate Collection (20%), Oral presentation (15%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an overview of the functional and phylogenetic diversity of invertebrate and vertebrate animals. The material is presented within the conceptual framework of evolution, the foundation of biology. Lectures explore the diversity of major functional systems and behaviour in the context of environmental challenges and the ecological roles of different animal groups. Laboratory classes include dissections and demonstrations of the functional anatomy of invertebrates and vertebrates, as well as experiments. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Recommended reading: Hickman CP, Roberts LS, Larson A, l'Anson H 2004. Integrated Principles of Zoology, 12th ed. McGraw Hill, NY. Withers, P. 1992 Comparative Animal Physiology. Saunders, New York

BIOL2921
Zoology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Mathew Crowther **Session:** Semester 1 **Classes:** Two 1-hour lectures, one tutorial/lecture and one 3-hour practical per week. **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** BIOL2021 or BIOL2011 or BIOL2911 or BIOL2012 or BIOL2912 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** One 2-hour theory exam (50%), Lab book (15%), Invertebrate Collection (20%), Advanced poster presentation (15%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2921 will be based on BIOL2021 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Recommended reading: Hickman CP, Roberts LS, Larson A, l'Anson H 2004. Integrated Principles of Zoology, 12th ed. McGraw Hill, NY. Withers, P. 1992 Comparative Animal Physiology. Saunders, New York

Breadth units

ANAT2009
Comparative Primate Anatomy

Credit points: 6 **Teacher/Coordinator:** Dr Denise Donlon **Session:** Semester 2 **Classes:** Two 1-hour lectures **Prohibitions:** ANAT2002 **Assumed knowledge:** BIOL1XX3 OR BIOL1XX8 **Assessment:** Two quizzes (10%), theory exam (60%), practical exam (30%). **Practical field work:** One 2-hour practical per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of student covers the musculo-skeletal anatomy of the human body with particular emphasis on human evolution and comparisons with apes and fossil hominids. The topics covered include the versatility of the human hand, in manipulation and locomotion, bipedalism, climbing and brachiation in apes, and the change in pelvic anatomy associated with bipedalism and obstetric consequences.

Textbooks

Kapit, W and Elson, LM 2014 The Anatomy Coloring Book. Addison-Wesley. 4th edition

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1 **Assessment:** Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks

Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

GEGE2001
Genetics and Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prohibitions:** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution.

GEGE2901
Genetics and Genomics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution. The Advanced mode of Genetics and Genomics will provide you with challenge and a higher level of academic rigour. You will have the opportunity to plan and carry out a project that will develop your skills in contemporary genetics/molecular biology techniques and will provide you with a greater depth of disciplinary understanding. The Advanced mode will culminate in a written report and in an oral presentation where you will discuss a recent breakthrough that has been enabled by the use of modern genetics and genomics technologies. This is a unit for anyone wanting to better understand the how genetics has shaped the earth and how it will shape the future.

Textbooks

TBA

MICR2031
Microbiology

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2931 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45-minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: one written assignment (15%), one group oral presentation (10%) and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the earth's trees. This unit of study will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require if you specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology or science education.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

MICR2931
Microbiology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prerequisites:** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2031 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45 minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: two written assignments (10%, 15%), and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the Earth's trees. In this unit of study you will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Detailed aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require to specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology, or science education. As an Advanced unit, MICR2931 provides increased challenge and academic rigour to develop a greater understanding and depth of disciplinary expertise. You will actively participate in a series of small group tutorials investigating the molecular detail of microbial communication and function, which will culminate in you creating a scientific research report that communicates your understanding of recent research in microbiology.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

BIOL2021
Zoology

Credit points: 6 **Teacher/Coordinator:** A/Prof Mathew Crowther **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prohibitions:** BIOL2921 or BIOL2011 or BIOL2911 or BIOL2012 or BIOL2912 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** One 2-hour theory exam (50%), Lab book (15%), Invertebrate Collection (20%), Oral presentation (15%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an overview of the functional and phylogenetic diversity of invertebrate and vertebrate animals. The material is presented within the conceptual framework of evolution, the foundation of biology. Lectures explore the diversity of major functional systems and behaviour in the context of environmental challenges and the ecological roles of different animal groups. Laboratory classes include dissections and demonstrations of the functional anatomy of invertebrates and vertebrates, as well as experiments. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Recommended reading: Hickman CP, Roberts LS, Larson A, l'Anson H 2004. Integrated Principles of Zoology, 12th ed. McGraw Hill, NY. Withers, P. 1992 Comparative Animal Physiology. Saunders, New York

BIOL2921
Zoology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Mathew Crowther **Session:** Semester 1 **Classes:** Two 1-hour lectures, one tutorial/lecture and one 3-hour practical per week. **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** BIOL2021 or BIOL2011 or BIOL2911 or BIOL2012 or BIOL2912 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** One 2-hour theory exam (50%), Lab book (15%), Invertebrate Collection (20%), Advanced poster presentation (15%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2921 will be based on BIOL2021 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Recommended reading: Hickman CP, Roberts LS, Larson A, l'Anson H 2004. Integrated Principles of Zoology, 12th ed. McGraw Hill, NY. Withers, P. 1992 Comparative Animal Physiology. Saunders, New York

BIOL2030
Botany

Credit points: 6 **Teacher/Coordinator:** A/Prof Rosanne Quinnell **Session:** Semester 1 **Classes:** Two 1-hour lecture/week; one 3-hour practical/week; a series of five 1-hour tutorial/week in the latter part of the semester **Prohibitions:** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2930 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quizzes (15%), anatomy project report and presentation (20%), practical exam (30%), theory exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are surrounded by plants, and rely on them every day for our wellbeing. Ecologists use botanical knowledge to help manage marine and terrestrial ecosystems, and public health and land management professionals depend on their understanding of plant science to help solve environmental problems and to enhance biosecurity. Botany aims to increase and improve our supply of medicines, foods, and other plant products, and is critical for anyone interested in contributing to the sustainable future of our planet. In this unit, you will explore the origins, diversity, and global significance of plants. You will gain insights into the micro- and macro-evolutionary processes and patterns behind how plants moved from aquatic ecosystems to terrestrial ecosystems. Integrated lectures, practical classes, and extensive online resources will allow you to develop and integrate practical skills and conceptual frame works in plant identification, plant physiology, plant anatomy, and plant morphology. Lectures and practical classes are augmented by self-instructional audio-visual sessions and by small group discussions to foster a sense of self-reliance and collaboration. Successful completion of BIOL2023 will allow you to contribute to a range of disciplines including: ecology, bioinformatics, molecular and cell biology, genetics and biotechnology, environmental law, agriculture, education and the arts.

Textbooks

Evert RF and Eichhorn SE. 2013. Raven: Biology of Plants. 8th Ed. Freeman and Co Publishers. New York. NY.
**School of Life and Env Sci. 201x. Botany and Botany Adv Study guide.
Additional reading:
Attwell BJ, Kriedeman PE, Turnbull CGN. 1999. Plants In Action. Macmillan, South Yarra. (Australian Plant Biology with a good section on ecophysiology).
Judd WS, Campbell CS, Kellogg EA, Stephens PF. 2007. Plant Systematics: a phylogenetic approach. 3rd Ed. Sinauer Associates Inc Massachusetts USA
Pellow B, Henwood M, Carolin R.C., 2009. Flora of the Sydney Region. 5th edition. Sydney University Press.
Simpson, MG. 2010. Plant Systematics Ed 2 Academic press (or Ed 1 2006)
Taiz L. Zeiger E. 2010. Plant Physiology. 5th Ed Sinauer. Sunderland, Mass.
Online learning resources:
Â¿LMS (currently BlackBoard)
Â¿BotanyOnline: http://botany.sydneybiology.org/

BIOL2930
Botany (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Rosanne Quinnell **Session:** Semester 1 **Classes:** Two 1-hour lectures/week; one 3-hour practical/week; a series of five 1-hour tutorial/week in the latter part of the semester

Prerequisites: Annual average mark of at least 70 in previous year **Prohibitions:** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2030 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quizzes (15%), advanced project report (20%), practical exam (30%), theory exam (35%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are surrounded by plants, and rely on them every day for our wellbeing. Ecologists use botanical knowledge to help manage marine and terrestrial ecosystems, and public health and land management professionals depend on their understanding of plant science to help solve environmental problems and to inform biosecurity. Botany aims to increase and improve our supply of medicines, foods, and other plant products, and is critical for anyone interested in contributing to the sustainable future of our planet. In this unit, you will explore the origins, diversity, and global significance of plants. You will gain insights into the micro- and macro-evolutionary processes and patterns behind how plants moved from aquatic ecosystems to terrestrial ecosystems. Integrated lectures, practical classes and extensive online resources will allow you to develop and integrate practical skills and conceptual frameworks in plant identification, and plant physiology, morphology and anatomy. Lectures and practical classes are augmented by discussions to foster a sense of self-reliance and collaboration. The Advanced Botany unit of study requires engagement at a high standard of academic rigour and affords opportunities to engage with core aspect of Botany at depth and to create new knowledge. In partnership with academic staff advanced students will undertake an independent research project, which will develop skills in research and communication.

Textbooks

Attwell BJ, Kriedeman PE, Turnbull CGN. 1999. Plants In Action. Macmillan, South Yarra. (Australian Plant Biology with a good section on ecophysiology).
Judd WS, Campbell CS, Kellogg EA, Stephens PF. 2007. Plant Systematics: a phylogenetic approach. 3rd Ed. Sinauer Associates Inc Massachusetts USA
Pellow B, Henwood M, Carolin R.C., 2009. Flora of the Sydney Region. 5th edition. Sydney University Press.
Simpson, MG. 2010. Plant Systematics Ed 2 Academic press (or Ed 1 2006)
Taiz L. Zeiger E. 2010. Plant Physiology. 5th Ed Sinauer. Sunderland, Mass.
**Essential.
Online learning resources:
Â¿LMS (currently BlackBoard)
Â¿BotanyOnline: http://botany.sydneybiology.org/

BIOL2032
Australian Wildlife Biology

Credit points: 6 **Teacher/Coordinator:** Dr Catherine Herbert **Session:** Semester 2 **Classes:** Three lectures; one 2-hour tutorial or practical session each week **Prohibitions:** ANSC2005 **Assessment:** Quizzes, presentation assignment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Australia is home to a broad diversity of vertebrate wildlife species, many of which are unique to the Australian environment, having evolved in isolation from other large land-masses for millions of years. This unit examines the diversity of Australian reptiles, amphibians, birds and mammals (including all three mammalian lineages; monotremes, marsupials and eutherian mammals). We focus on the unique anatomical, physiological and behavioural adaptations that have enabled our wildlife to survive and thrive within varied Australian ecosystems. We also examine how the uniqueness of our wildlife is also one of its greatest challenges, being naÂ¿ve to the new threats that are present in our rapidly changing environments. At the end of this unit you should have an appreciation of the diversity and uniqueness of Australian wildlife; be able to determine the links between form and function in wildlife and understand the significance of these functional adaptations in relation to ecological challenges. You will also have an understanding of the interactions between humans and wildlife, and how the unique characteristics of our wildlife also make them vulnerable to threats within the rapidly changing Australian environment. Students will also develop enhanced scientific literacy and communication skills through tutorial activities and assessment tasks.

Textbooks

No text book requirements. Recommended reading throughout semester provided by each lecture relevant to their class content. Relevant scientific papers will be uploaded to LMS

BIOL2029
Cells

Credit points: 6 **Teacher/Coordinator:** Dr Murray Thomson **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 4-hour practical per week **Prerequisites:** BIOL1XX7 or MBLG1XXX **Prohibitions:** BIOL2016 or BIOL2916 or BIOL2929 **Assessment:** 3-hour theory exam (60%), quizzes (lectures and laboratory work) (10%), marks for laboratory work (10%), report (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cell Biology is one of the most dynamic areas in science today. During development, a single cell zygote must undergo numerous divisions to become a multi-cellular organism. In both plants and animals, cell to cell communication and coordination of the cell cycle, as well as cellular division and migration, are vital for normal development. Stem cells follow specialisation pathways to become increasingly committed to differentiation, and transformation into specialised cells that group together to form the variety of tissues that make up animals and plants. In this unit you will investigate, the diversity of cell types, how these different cells interact with each other, how the cell cycle is controlled as well as studying the roles of cellular movement, differentiation and interaction in reproduction and development. In Cells you will develop a deep understanding of the established knowledge base and develop research skills to extend this knowledge. Discussions will incorporate recent advances in cell research including the regenerative potential of stem cells and their use in treatments to replace damaged and diseased tissue. The laboratory program, provides you with hands on training in key techniques such as in vitro cell culture, organelle isolation and experimentation, as well as microscopy. These skills will prepare you for a research pathway and/or a career that includes cell biology.

Textbooks

Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P. (2014) Molecular Biology of the Cell (Sixth edition). Garland Publishing Inc., New York and London (ISBN-9780815344643)

BIOL2929
Cells (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Murray Thomson **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 4-hour practical per week **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) **Prohibitions:** BIOL2016 or BIOL2916 orBIOL2029 **Assessment:** 3-hour theory exam (60%), quizzes (lectures and laboratory work) (10%), marks for laboratory work (10%), advanced report (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cell biology is one of the most dynamic areas of modern research. During development, a single cell zygote must undergo numerous divisions to become a multi-cellular organism. In both plants and animals, cell-to-cell communication and coordination of the cell cycle, as well as cellular division and migration, are vital for normal development. Stem cells follow specialisation pathways to become increasingly committed to differentiation, and transformation into specialised cells that group together to form the variety of tissues that make up animals and plants. In this unit you will investigate, the diversity of cell types, how these different cells interact with each other, how the cell cycle is controlled as well as studying the roles of cellular movement, differentiation and interaction in reproduction and development. In Cells you will develop a deep understanding of the established knowledge base and develop research skills to extend this knowledge. Discussions will incorporate recent advances in cell research including the regenerative potential of stem cells and their use in treatments to replace damaged and diseased tissue. The advanced program, will provide you with an opportunity to complete an authentic research project in a specialized area of cell biology.

Textbooks

Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P. (2014) Molecular Biology of the Cell (Sixth edition). Garland Publishing Inc., New York and London (ISBN-9780815344643)

BIOL2033
Entomology

Credit points: 6 **Teacher/Coordinator:** Dr Tanya Latty **Session:** Semester 2 **Classes:** Two 1-hour lectures; one 3-hour practical sessions a weekly basis **Prohibitions:** ENTO2001 **Assessment:** Practical test, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Insects are the most abundant and diverse group of animals on earth; beetles alone account for 25% of animal life. Insects impact almost every facet of the ecosystem and our lives. Many insects play valuable and essential roles in pollinating different plant species, in predating and controlling insect pests and in recycling nutrients. Other insects are harmful and are the vectors for major diseases such as plague, malaria and recently emerged viral disease Zika. This unit will provide students with a broad introduction to entomology including insect evolution, ecology, anatomy and physiology. Students will learn applied entomological topics such as sustainable insect management in agricultural ecosystems, medical and veterinary entomology, insect-inspired technologies, and insects as a future food source for both livestock and humans. This theoretical background will be complemented by training in how to use and evaluate a range of identification tools such as lucid and traditional dichotomous keys that enable you to identify and classify major groups of insects. Practical classes will allow you to develop your identification, classification and preservation skills though examination of boxes of 'mystery insects' and through creating a museum-quality insect collection. Students will also learn procedures for caring and rearing live insects. By the end of the unit you will be well prepared to work in fields that require entomological skills.

Textbooks

Info will be made available via Blackboard. Keys will be available in practical classes and in the lab Manual

BIOL2031
Plants and Environment

Credit points: 6 **Teacher/Coordinator:** Prof Brent Kaiser **Session:** Semester 2 **Classes:** Two lectures; one 4-hour practical session on a weekly basis **Prohibitions:** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2931 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quiz (20%), lab assignment (15%), presentation (15%), exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Plants grow across a range of environments, influencing form, function and ultimately reproductive success. Being sessile, plants lack the luxury of seeking an alternative 'stress-free lifestyle' and therefore rely on genetic and physical adaptations to survive and reproduce. To understand how a plant can achieve such flexibility requires knowledge of plant structure and the influence of environmental drivers on plant growth and function. In this unit, you will examine the physiological processes controlling plant growth and reproduction linked to environmental constraints. You will understand the relationship between tissue and cellular structure and their underlying role in physiological and metabolic activities, particularly processes involving light capture, photosynthesis, water regulation, nutrient management and metabolite redistribution. Lectures and interactive practicals will together introduce you to plant processes that underpin life on earth. Experimentation and analysis of plant physiological processes will develop a skill base that will lead to a greater understanding and appreciation of common plant processes. As a component of the Plant Science minor and the Plant Production major, BIOL2031 will provide an important platform to extend your interests in plant science and plant related fields across the curriculum.

Textbooks

Taiz, L. and Zeiger, E. (2010) Plant Physiology, Fifth Edition. Sinauer Associates. Sunderland, MA.

BIOL2931
Plants and Environment (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Brent Kaiser **Session:** Semester 2 **Classes:** Two 1-hour lectures/week; one 4-hour practical/week **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2031 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** On-line quiz (20%), lab assignment (15%), independent project (15%), exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Plants grow across a range of environments, which influence form, function and ultimately reproductive success. Being sessile, plants lack the luxury of seeking an alternative 'stress-free lifestyle' and therefore rely on genetic and physical adaptations to help survive and reproduce. To understand how a plant can achieve such flexibility requires an understanding of plant structure and the influence that environmental drivers have on plant growth and function. In this unit, you will examine the physiological processes controlling plant growth and reproduction linked to environmental constraints. You will understand the relationship between tissue and cellular structure and their underlying role in physiological and metabolic activities, particularly processes involving light capture, photosynthesis, water regulation, nutrient management and metabolite redistribution. Lectures and interactive practicals will together introduce you to plant processes that we commonly depend upon for food production, and plant related materials. Experimentation and analysis of plant physiological processes will develop a skill base that will lead to a greater understanding and appreciation of common plant processes that guide plant growth. As a component of the Plant Science minor, this unit will provide an important platform to extend your interests in plant science and plant-related fields, including ecology, cell biology, genetics, breeding, agriculture, molecular biology, environmental law, education and the arts. The advanced unit has the same overall concepts as BIOL2031 but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in BIOL2931 participate in alternative components, which include a separate lecture and practical stream. The content and nature of these components may vary from year to year.

Textbooks

Resources required by the unit will be provided on the Blackboard learning management page for the unit. Taiz, L. and Zeiger, E. (2010) Plant Physiology, Fifth Edition. Sinauer Associates. Sunderland, MA.

IMMU2X11 to be deveoped for offering in 2019.

3000-level units of study

Field units

BIOL3007
Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3907 **Assessment:** One 2-hour exam, group presentations, one essay, one project report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the dynamics of ecological systems, and considers the interactions between individual organisms and populations, organisms and the environment, and ecological processes. Lectures are grouped around four dominant themes: Interactions, Evolutionary Ecology, The Nature of Communities, and Conservation and Management. Emphasis is placed throughout on the importance of quantitative methods in ecology, including sound planning and experimental designs, and on the role of ecological science in the conservation, management, exploitation and control of populations. Relevant case studies and examples of ecological processes are drawn from marine, freshwater and terrestrial systems, with plants, animals, fungi and other life forms considered as required. Students will have some opportunity to undertake short term ecological projects, and to take part in discussions of important and emerging ideas in the ecological literature.

Textbooks

Begon M, Townsend CR, Harper JL (2005) Ecology, From individuals to ecosystems. Wiley-Blackwell.

BIOL3907
Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two lectures per week, weekly tutorial and 3-hour practical per week **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3007 **Assessment:** One 2-hour exam, presentations, one essay, one project report (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as BIOL3007 Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study participate in alternatives to some elements of the standard course and will be encouraged to pursue the objectives by more independent means in a series of research tutorials. Specific details of this unit of study and assessment will be announced in meetings with students in week 1 of semester 2. This unit of study may be taken as part of the BSc (Advanced) program.

Textbooks

As for BIOL3007

BIOL3008
Marine Field Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Ross Coleman **Session:** Intensive July **Classes:** Intensive 8-day field course held in the pre-semester break. **Prerequisites:** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3908 or BIOL2028 or BIOL2928 **Assessment:** Discussion groups, research project proposal, biodiversity survey report, data analysis and checking, research project report (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This field course provides a practical introduction to the experimental analysis of marine populations and assemblages. Students gain experience using a range of intertidal sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. No particular mathematical or statistical skills are required for this subject. Group experimental research projects in the field are the focus of the unit during the day, with lectures and discussion groups about the analysis of experimental data and current issues in experimental marine ecology occurring in the evening.

Textbooks

No textbook is prescribed but Coastal Marine Ecology of Temperate Australia. Eds. Underwood, A.J. & Chapman, M.G. 1995. University of New South Wales Press, provides useful background reading.

BIOL3908
Marine Field Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Ross Coleman. **Session:** Intensive July **Classes:** One 8-day field course held in the pre-semester break, plus four 1-hour tutorials during semester 2. **Prerequisites:** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3008 or BIOL2028 or BIOL2928 **Assessment:** Discussion groups, research project proposal, biodiversity report, data analysis and checking, research project report (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This unit has the same objectives as Marine Field Ecology BIOL3008, and is suitable for students wishing to pursue certain aspects of marine field ecology in a greater depth. Entry is restricted and selection is made from applicants on the basis of past performance. Students taking this unit of study will be expected to take part in a number of additional tutorials after the field course on advanced aspects of experimental design and analysis and will be expected to incorporate these advanced skills into their analyses and project reports. This unit may be taken as part of the BSc(Advanced).

Textbooks

As for BIOL 3008.

BIOL3009
Terrestrial Field Ecology

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** Note: One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3909 or BIOL2009 or BIOL2909 **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), specimen collection (10%), research project report (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

This intensive field-based course provides practical experience in terrestrial ecology suited to a broad range of careers in ecology, environmental consulting and wildlife management. Students learn a broad range of ecological sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. The field work takes place in native forest and incorporates survey techniques for plants, small mammals and invertebrates and thus provides a good background for ecological consulting work and an introduction into large-scale project management. Students attend a week-long field course and participate in a large-scale research project as well as conducting their own research project. Emphasis is placed on critical thinking in the context of environmental management and technical skills are developed in the area of data handling and analysis, report writing and team work. Invited experts contribute to the lectures and discussions on issues relating to the ecology, conservation and management of Australia's terrestrial flora and fauna.

BIOL3909
Terrestrial Field Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3009 or BIOL2009 or BIOL2909 **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), sample and data processing (10%), research project report (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered. This unit is not offered from 2019.

This unit has the same objectives as BIOL3009 Terrestrial Field Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from applicants on the basis of previous performance. Students taking this unit of study will complete an individual research project on a topic negotiated with a member of staff. It is expected that much of the data collection will be completed during the field trip but some extra time may be needed during semester 2. Specific details of this unit of study and assessment will be announced in meetings with students at the beginning of the unit. This unit of study may be taken as part of the BSc (Advanced) program.

BIOL3010
Tropical Wildlife Biology

Credit points: 6 **Teacher/Coordinator:** Dr Matthew Greenless **Session:** Intensive February **Classes:** One week intensive field trip to the Northern Territory plus one week intensive lecture and prac session at Sydney University. **Prerequisites:** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3910 or BIOL2010 or BIOL2910 **Assessment:** One 2-hour theory exam, one 1-hour practical exam, one 1500-word report, one 2000-word paper, one 15-minute oral presentation (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit runs in February. It cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2017, 2019) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

Australia has a unique terrestrial vertebrate fauna, but also has the worst record of recent mammalian extinctions. Because of Australia's unusual climate, landforms, and the rarity of many species, the management of our native wildlife presents special challenges for biologists, conservationists and land managers. This unit of study addresses the biogeography, ecology and management of Australia's terrestrial fauna. The subject comprises of a five-day field course at Mary River Park in the Northern Territory. During the course, students will learn how to carry out wildlife surveys, how to identify animals, how to track wildlife, and how to design and complete a field experiment. The field trip will be complemented by guest lectures from experts in the fields of evolution, ecology and wildlife management. A one day field trip to Litchfield National Park will be held on the last day of the field course.

BIOL3910
Tropical Wildlife Biology (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Matthew Greenless **Session:** Intensive February **Classes:** One week intensive field trip to the Northern Territory plus one week intensive lecture and prac session at Sydney University. **Prerequisites:** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3010 or BIOL2010 or BIOL2910 **Assessment:** One 2-hour theory exam, one 1-hour practical exam, one 1500-word report, one 2000-word paper, one 15-minute oral presentation (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit runs in February. It cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2017, 2019) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This unit has the same objectives as BIOL3010 Tropical Wildlife Biology and Management, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study will participate in alternatives to some elements of the standard course and will be required to pursue the objectives by more independent means. For example, student willl be able to design and carry out their own field or laboratory experiment, and complete it during the five day firled trip. Specific details of this unit of study and assessment will be announced in meetings with students at the beginning of the unit.

BIOL3016
Coral Reef Biology

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Intensive July **Classes:** Fieldwork 80 hours block mode (during July) **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3916 or BIOL2020 or BIOL2920 or NTMP3001 **Assessment:** Participation in field work, essay, project report and an exam (100%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

Coral Reef Biology is an intensive unit held at a research station on the Great Barrier Reef. The unit focuses on the dominant taxa in coral reef environments and the linkages between them. Emphasis is placed on the biological adaptations for life in tropical waters and the ecological, oceanographic and physiological processes involved. Aspects covered include: processes influencing the distribution of coral reefs, symbiosis, reef connectivity, lagoon systems, nutrient cycling and the impacts of climate change and other anthropogenic pressures on the world's corals reefs.

BIOL3916
Coral Reef Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Intensive July **Classes:** Fieldwork 80 hours block mode (during July) **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3016 or BIOL2020 or BIOL2920 or NTMP3001 **Assessment:** Participation in field work, essay, project report and exam (100%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

This unit has the same objectives as BIOL3016, Coral Reef Biology, and is suitable for students who wish to pursue certain aspects of tropical marine biology in greater depth, with a focus on the GBR. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study will pursue individual projects in consultation with, and under the guidance of, the course coordinator. The aim is to design a project relating to the particular interests of the student. The nature of these projects will vary from year to year. This unit of study may be taken as part of the BSc (Advanced) program.

Major selective units

BIOL3013
Marine Biology

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 4-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3913 **Assessment:** Practical reports, data exercises and exams (100%). **Practical field work:** Combination of field, lab and computer based practical activities **Mode of delivery:** Normal (lecture/lab/tutorial) day

We will examine in detail processes that are important for the establishment and maintenance of marine communities. Lectures will expose students to the key ideas, researchers and methodologies within selected fields of marine biology. Laboratory sessions and field excursions will complement the lectures by providing students with hands-on experience with the organisms and the processes that affect them. Students will develop critical analysis and scientific writing skills while examining the current literature.

BIOL3913
Marine Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Semester 2 **Classes:** See BIOL3013. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3013 **Assessment:** Practical reports, data exercises and exams (100%). **Practical field work:** Combination of field, lab and computer-based practical activities **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of the BIOL3013 Marine Biology unit. The content and nature of these components may vary from year to year but generally involves an individual or group project, conducted with unit instructors, which takes the place of one of the practical-based assessments..

BIOL3018
Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

BIOL3918
Gene Technology and Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **Prohibitions:** BIOL3018 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of BIOL3018 Gene Technology and Genomics. The content and nature of these components may vary from year to year.

BIOL3026
Developmental Genetics

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **Prohibitions:** BIOL3926 **Assessment:** One 2-hour exam, assignments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Developmental genetics discusses major concepts and our current understanding of developmental biology with an emphasis on molecular genetics. The developmental genetics of animal and plant systems will be investigated, along with approaches used to determine gene function in relation to development of complex multicellular organisms. Topics include the features and resources for model organisms; the generation of mutants for forward and reverse genetics; the application of mutants to the study gene function and gene networks; spatial and temporal gene expression in pattern formation; quantitative trait loci analysis; utility of genome wide association studies; epigenetics in relation to inheritance; genome information in the study of human genetics. Reference will be made to the use of modern techniques in developmental biology such as transgenics, recombinant DNA technology, tissue-specific expression analysis. Various methods of genetic mapping will be covered. Practical work complements the theoretical aspects of the course and develops important skills in genetics.

BIOL3926
Developmental Genetics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **Prohibitions:** BIOL3929 or BIOL3026 **Assessment:** One 2-hour exam, assignments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components to BIOL3026 Developmental Genetics. The content and nature of these components may vary from year to year. Some assessment will be in an alternative format to components of BIOL3026.

BIOL3045
Animal Ecological Physiology

Credit points: 6 **Teacher/Coordinator:** Prof Frank Seebacher **Session:** Semester 1 **Classes:** Two lectures and three practicals per week **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3945 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912 **Assessment:** Two practical reports (20% and 40% of total marks, respectively), one 1.5-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Ecological Physiology is a conceptually based unit of study that covers physiological interactions between organisms and their environments. The unit explores evolutionary processes that allow animals to persist in variable environments. These concepts are essential to understanding biodiversity and ecological function of animal populations, and how these are likely to change under future climate change. The unit will be suitable for those with an interest in zoology, as well as students with a particular interest in ecology and evolution. There is a strong focus on experimental biology and incorporating theory into practical classes, during which students design their own experiments. Good working knowledge of statistical analyses is assumed. The unit provides essential skills for conducting and presenting research, and for critical evaluation of published research.

BIOL3945
Animal Ecological Physiology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Frank Seebacher **Session:** Semester 1 **Classes:** Two lectures and three practicals per week. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3045 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912 **Assessment:** One practical report (20%) and one advanced report (40%), one 1.5-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content will be based on the standard unit BIOL3045 but qualified students will participate in alternative components at a more advanced level. Animal Ecological Physiology is a conceptually based unit of study that covers physiological interactions between organisms and their environments. The unit explores evolutionary processes that allow animals to persist in variable environments. These concepts are essential to understanding biodiversity and ecological function of animal populations, and how these are likely to change under future climate change. The unit will be suitable for those with an interest in zoology, as well as students with a particular interest in ecology and evolution. There is a strong focus on experimental biology and incorporating theory into practical classes, during which students design their own experiments. Good working knowledge of statistical analyses is assumed. The unit provides essential skills for conducting and presenting research, and for critical evaluation of published research.

BIOL3046
Animal Behaviour

Credit points: 6 **Teacher/Coordinator:** Prof Ashley Ward **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3946 or BIOL3025 or BIOL3925 **Assessment:** Practical reports, one 2-hour exam (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit will provide a broad overview of the scientific study of animal behaviour. It will consider mechanistic and functional explanations of animal behaviour across contexts including kin selection and altruism, sociality, foraging, aggression and competition, sexual selection and mate choice, the behaviour of predators and prey, and communication and signalling. The information presented and discussed in this unit will reflect the most up-to-date research in each aspect of the field of animal behaviour. Practical sessions are closely aligned with the lecture material and will foster the development of key skills by providing hands-on experience of experimental design, data collection and analysis.

Textbooks

Davies, Krebs, West: An Introduction to Behavioural Ecology, 4th edition, Wiley-Blackwell.

BIOL3946
Animal Behaviour (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Ashley Ward **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3046 or BIOL3025 or BIOL3925 **Assessment:** Practical reports, one 2-hour exam (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The content will be based on the standard unit BIOL3046 but qualified students will participate in alternative components at a more advanced level. The unit will provide a broad overview of the scientific study of animal behaviour. It will consider mechanistic and functional explanations of animal behaviour across contexts including kin selection and altruism, sociality, foraging, aggression and competition, sexual selection and mate choice, the behaviour of predators and prey, and communication and signalling. The information presented and discussed in this unit will reflect the most up-to-date research in each aspect of the field of animal behaviour. Practical sessions are closely aligned with the lecture material and will foster the development of key skills by providing hands-on experience of experimental design, data collection and analysis.

Textbooks

Davies, Krebs, West: An Introduction to Behavioural Ecology, 4th edition, Wiley-Blackwell.

Minor selective units

BIOL3007
Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3907 **Assessment:** One 2-hour exam, group presentations, one essay, one project report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the dynamics of ecological systems, and considers the interactions between individual organisms and populations, organisms and the environment, and ecological processes. Lectures are grouped around four dominant themes: Interactions, Evolutionary Ecology, The Nature of Communities, and Conservation and Management. Emphasis is placed throughout on the importance of quantitative methods in ecology, including sound planning and experimental designs, and on the role of ecological science in the conservation, management, exploitation and control of populations. Relevant case studies and examples of ecological processes are drawn from marine, freshwater and terrestrial systems, with plants, animals, fungi and other life forms considered as required. Students will have some opportunity to undertake short term ecological projects, and to take part in discussions of important and emerging ideas in the ecological literature.

Textbooks

Begon M, Townsend CR, Harper JL (2005) Ecology, From individuals to ecosystems. Wiley-Blackwell.

BIOL3907
Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two lectures per week, weekly tutorial and 3-hour practical per week **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3007 **Assessment:** One 2-hour exam, presentations, one essay, one project report (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as BIOL3007 Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study participate in alternatives to some elements of the standard course and will be encouraged to pursue the objectives by more independent means in a series of research tutorials. Specific details of this unit of study and assessment will be announced in meetings with students in week 1 of semester 2. This unit of study may be taken as part of the BSc (Advanced) program.

Textbooks

As for BIOL3007

BIOL3013
Marine Biology

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 4-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3913 **Assessment:** Practical reports, data exercises and exams (100%). **Practical field work:** Combination of field, lab and computer based practical activities **Mode of delivery:** Normal (lecture/lab/tutorial) day

We will examine in detail processes that are important for the establishment and maintenance of marine communities. Lectures will expose students to the key ideas, researchers and methodologies within selected fields of marine biology. Laboratory sessions and field excursions will complement the lectures by providing students with hands-on experience with the organisms and the processes that affect them. Students will develop critical analysis and scientific writing skills while examining the current literature.

BIOL3913
Marine Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Semester 2 **Classes:** See BIOL3013. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3013 **Assessment:** Practical reports, data exercises and exams (100%). **Practical field work:** Combination of field, lab and computer-based practical activities **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of the BIOL3013 Marine Biology unit. The content and nature of these components may vary from year to year but generally involves an individual or group project, conducted with unit instructors, which takes the place of one of the practical-based assessments..

BIOL3018
Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

BIOL3918
Gene Technology and Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **Prohibitions:** BIOL3018 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of BIOL3018 Gene Technology and Genomics. The content and nature of these components may vary from year to year.

BIOL3026
Developmental Genetics

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **Prohibitions:** BIOL3926 **Assessment:** One 2-hour exam, assignments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Developmental genetics discusses major concepts and our current understanding of developmental biology with an emphasis on molecular genetics. The developmental genetics of animal and plant systems will be investigated, along with approaches used to determine gene function in relation to development of complex multicellular organisms. Topics include the features and resources for model organisms; the generation of mutants for forward and reverse genetics; the application of mutants to the study gene function and gene networks; spatial and temporal gene expression in pattern formation; quantitative trait loci analysis; utility of genome wide association studies; epigenetics in relation to inheritance; genome information in the study of human genetics. Reference will be made to the use of modern techniques in developmental biology such as transgenics, recombinant DNA technology, tissue-specific expression analysis. Various methods of genetic mapping will be covered. Practical work complements the theoretical aspects of the course and develops important skills in genetics.

BIOL3926
Developmental Genetics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **Prohibitions:** BIOL3929 or BIOL3026 **Assessment:** One 2-hour exam, assignments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components to BIOL3026 Developmental Genetics. The content and nature of these components may vary from year to year. Some assessment will be in an alternative format to components of BIOL3026.

BIOL3045
Animal Ecological Physiology

Credit points: 6 **Teacher/Coordinator:** Prof Frank Seebacher **Session:** Semester 1 **Classes:** Two lectures and three practicals per week **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3945 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912 **Assessment:** Two practical reports (20% and 40% of total marks, respectively), one 1.5-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Ecological Physiology is a conceptually based unit of study that covers physiological interactions between organisms and their environments. The unit explores evolutionary processes that allow animals to persist in variable environments. These concepts are essential to understanding biodiversity and ecological function of animal populations, and how these are likely to change under future climate change. The unit will be suitable for those with an interest in zoology, as well as students with a particular interest in ecology and evolution. There is a strong focus on experimental biology and incorporating theory into practical classes, during which students design their own experiments. Good working knowledge of statistical analyses is assumed. The unit provides essential skills for conducting and presenting research, and for critical evaluation of published research.

BIOL3945
Animal Ecological Physiology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Frank Seebacher **Session:** Semester 1 **Classes:** Two lectures and three practicals per week. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3045 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912 **Assessment:** One practical report (20%) and one advanced report (40%), one 1.5-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content will be based on the standard unit BIOL3045 but qualified students will participate in alternative components at a more advanced level. Animal Ecological Physiology is a conceptually based unit of study that covers physiological interactions between organisms and their environments. The unit explores evolutionary processes that allow animals to persist in variable environments. These concepts are essential to understanding biodiversity and ecological function of animal populations, and how these are likely to change under future climate change. The unit will be suitable for those with an interest in zoology, as well as students with a particular interest in ecology and evolution. There is a strong focus on experimental biology and incorporating theory into practical classes, during which students design their own experiments. Good working knowledge of statistical analyses is assumed. The unit provides essential skills for conducting and presenting research, and for critical evaluation of published research.

BIOL3046
Animal Behaviour

Credit points: 6 **Teacher/Coordinator:** Prof Ashley Ward **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3946 or BIOL3025 or BIOL3925 **Assessment:** Practical reports, one 2-hour exam (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit will provide a broad overview of the scientific study of animal behaviour. It will consider mechanistic and functional explanations of animal behaviour across contexts including kin selection and altruism, sociality, foraging, aggression and competition, sexual selection and mate choice, the behaviour of predators and prey, and communication and signalling. The information presented and discussed in this unit will reflect the most up-to-date research in each aspect of the field of animal behaviour. Practical sessions are closely aligned with the lecture material and will foster the development of key skills by providing hands-on experience of experimental design, data collection and analysis.

Textbooks
Davies, Krebs, West: An Introduction to Behavioural Ecology, 4th edition, Wiley-Blackwell.

BIOL3946
Animal Behaviour (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Ashley Ward **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3046 or BIOL3025 or BIOL3925 **Assessment:** Practical reports, one 2-hour exam (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The content will be based on the standard unit BIOL3046 but qualified students will participate in alternative components at a more advanced level. The unit will provide a broad overview of the scientific study of animal behaviour. It will consider mechanistic and functional explanations of animal behaviour across contexts including kin selection and altruism, sociality, foraging, aggression and competition, sexual selection and mate choice, the behaviour of predators and prey, and communication and signalling. The information presented and discussed in this unit will reflect the most up-to-date research in each aspect of the field of animal behaviour. Practical sessions are closely aligned with the lecture material and will foster the development of key skills by providing hands-on experience of experimental design, data collection and analysis.

Textbooks
Davies, Krebs, West: An Introduction to Behavioural Ecology, 4th edition, Wiley-Blackwell.

BIOL3029, BIOL3033, BIOL3020 to be developed for offering in 2019.

Plant Science Minor

A minor in Plant Science requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 6 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units

Units of Study

The units of study are listed below.

1000-level units of study

Core

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:**

BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks

Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks

Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks

Please see unit outline on LMS

Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

2000-level units of study

Core

BIOL2030
Botany

Credit points: 6 **Teacher/Coordinator:** A/Prof Rosanne Quinnell **Session:** Semester 1 **Classes:** Two 1-hour lecture/week; one 3-hour practical/week; a series of five 1-hour tutorial/week in the latter part of the semester **Prohibitions:** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2930 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quizzes (15%), anatomy project report and presentation (20%), practical exam (30%), theory exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are surrounded by plants, and rely on them every day for our wellbeing. Ecologists use botanical knowledge to help manage marine and terrestrial ecosystems, and public health and land management professionals depend on their understanding of plant science to help solve environmental problems and to enhance biosecurity. Botany aims to increase and improve our supply of medicines, foods, and other plant products, and is critical for anyone interested in contributing to the sustainable future of our planet. In this unit, you will explore the origins, diversity, and global significance of plants. You will gain insights into the micro- and macro-evolutionary processes and patterns behind how plants moved from aquatic ecosystems to terrestrial ecosystems. Integrated lectures, practical classes, and extensive online resources will allow you to develop and integrate practical skills and conceptual frame works in plant identification, plant physiology, plant anatomy, and plant morphology. Lectures and practical classes are augmented by self-instructional audio-visual sessions and by small group discussions to foster a sense of self-reliance and collaboration. Successful completion of BIOL2023 will allow you to contribute to a range of disciplines including: ecology, bioinformatics, molecular and cell biology, genetics and biotechnology, environmental law, agriculture, education and the arts.

Textbooks
Evert RF and Eichhorn SE. 2013. Raven: Biology of Plants. 8th Ed. Freeman and Co Publishers. New York. NY.
**School of Life and Env Sci. 201x. Botany and Botany Adv Study guide.
Additional reading:
Attwell BJ, Kriedeman PE, Turnbull CGN. 1999. Plants In Action. Macmillan, South Yarra. (Australian Plant Biology with a good section on ecophysiology).
Judd WS, Campbell CS, Kellogg EA, Stephens PF. 2007. Plant Systematics: a phylogenetic approach. 3rd Ed. Sinauer Associates Inc Massachusetts USA
Pellow B, Henwood M, Carolin R.C., 2009. Flora of the Sydney Region. 5th edition. Sydney University Press.
Simpson, MG. 2010. Plant Systematics Ed 2 Academic press (or Ed 1 2006)
Taiz L. Zeiger E. 2010. Plant Physiology. 5th Ed Sinauer. Sunderland, Mass.
Online learning resources:
Â¿LMS (currently BlackBoard)
Â¿BotanyOnline: http://botany.sydneybiology.org/

BIOL2930
Botany (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Rosanne Quinnell **Session:** Semester 1 **Classes:** Two 1-hour lectures/week; one 3-hour practical/week; a series of five 1-hour tutorial/week in the latter part of the semester **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2030 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quizzes (15%), advanced project report (20%), practical exam (30%), theory exam (35%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are surrounded by plants, and rely on them every day for our wellbeing. Ecologists use botanical knowledge to help manage marine and terrestrial ecosystems, and public health and land management professionals depend on their understanding of plant science to help solve environmental problems and to inform biosecurity. Botany aims to increase and improve our supply of medicines, foods, and other plant products, and is critical for anyone interested in contributing to the sustainable future of our planet. In this unit, you will explore the origins, diversity, and global significance of plants. You will gain insights into the micro- and macro-evolutionary processes and patterns behind how plants moved from aquatic ecosystems to terrestrial ecosystems. Integrated lectures, practical classes and extensive online resources will allow you to develop and integrate practical skills and conceptual frameworks in plant identification, and plant physiology, morphology and anatomy. Lectures and practical classes are augmented by discussions to foster a sense of self-reliance and collaboration. The Advanced Botany unit of study requires engagement at a high standard of academic rigour and affords opportunities to engage with core aspect of Botany at depth and to create new knowledge. In partnership with academic staff advanced students will undertake an independent research project, which will develop skills in research and communication.

Textbooks
Attwell BJ, Kriedeman PE, Turnbull CGN. 1999. Plants In Action. Macmillan, South Yarra. (Australian Plant Biology with a good section on ecophysiology).
Judd WS, Campbell CS, Kellogg EA, Stephens PF. 2007. Plant Systematics: a phylogenetic approach. 3rd Ed. Sinauer Associates Inc Massachusetts USA
Pellow B, Henwood M, Carolin R.C., 2009. Flora of the Sydney Region. 5th edition. Sydney University Press.
Simpson, MG. 2010. Plant Systematics Ed 2 Academic press (or Ed 1 2006)
Taiz L. Zeiger E. 2010. Plant Physiology. 5th Ed Sinauer. Sunderland, Mass.
**Essential.
Online learning resources:
Â¿LMS (currently BlackBoard)
Â¿BotanyOnline: http://botany.sydneybiology.org/

BIOL2031
Plants and Environment

Credit points: 6 **Teacher/Coordinator:** Prof Brent Kaiser **Session:** Semester 2 **Classes:** Two lectures; one 4-hour practical session on a weekly basis **Prohibitions:** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2931 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quiz (20%), lab assignment (15%), presentation (15%), exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Plants grow across a range of environments, influencing form, function and ultimately reproductive success. Being sessile, plants lack the luxury of seeking an alternative 'stress-free lifestyle' and therefore rely on genetic and physical adaptations to survive and reproduce. To understand how a plant can achieve such flexibility requires knowledge of plant structure and the influence of environmental drivers on plant growth and function. In this unit, you will examine the physiological processes controlling plant growth and reproduction linked to environmental constraints. You will understand the relationship between tissue and cellular structure and their underlying role in physiological and metabolic activities, particularly processes involving light capture, photosynthesis, water regulation, nutrient management and metabolite redistribution. Lectures and interactive practicals will together introduce you to plant processes that underpin life on earth. Experimentation and analysis of plant physiological processes will develop a skill base that will lead to a greater understanding and appreciation of common plant processes. As a component of the Plant Science minor and the Plant Production major, BIOL2031 will provide an important platform to extend your interests in plant science and plant related fields across the curriculum.

Textbooks

Taiz, L. and Zeiger, E. (2010) Plant Physiology, Fifth Edition. Sinauer Associates. Sunderland, MA.

BIOL2931
Plants and Environment (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Brent Kaiser **Session:** Semester 2 **Classes:** Two 1-hour lectures/week; one 4-hour practical/week **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2031 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** On-line quiz (20%), lab assignment (15%), independent project (15%), exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Plants grow across a range of environments, which influence form, function and ultimately reproductive success. Being sessile, plants lack the luxury of seeking an alternative 'stress-free lifestyle' and therefore rely on genetic and physical adaptations to help survive and reproduce. To understand how a plant can achieve such flexibility requires an understanding of plant structure and the influence that environmental drivers have on plant growth and function. In this unit, you will examine the physiological processes controlling plant growth and reproduction linked to environmental constraints. You will understand the relationship between tissue and cellular structure and their underlying role in physiological and metabolic activities, particularly processes involving light capture, photosynthesis, water regulation, nutrient management and metabolite redistribution. Lectures and interactive practicals will together introduce you to plant processes that we commonly depend upon for food production, and plant related materials. Experimentation and analysis of plant physiological processes will develop a skill base that will lead to a greater understanding and appreciation of common plant processes that guide plant growth. As a component of the Plant Science minor, this unit will provide an important platform to extend your interests in plant science and plant-related fields, including ecology, cell biology, genetics, breeding, agriculture, molecular biology, environmental law, education and the arts. The advanced unit has the same overall concepts as BIOL2031 but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in BIOL2931 participate in alternative components, which include a separate lecture and practical stream. The content and nature of these components may vary from year to year.

Textbooks

Resources required by the unit will be provided on the Blackboard learning management page for the unit. Taiz, L. and Zeiger, E. (2010) Plant Physiology, Fifth Edition. Sinauer Associates. Sunderland, MA.

3000-level units of study

Core

BOL3020 to be developed for offering in 2019.

Selective

BIOL3009
Terrestrial Field Ecology

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** Note: One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3909 or BIOL2009 or BIOL2909 **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), specimen collection (10%), research project report (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

This intensive field-based course provides practical experience in terrestrial ecology suited to a broad range of careers in ecology, environmental consulting and wildlife management. Students learn a broad range of ecological sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. The field work takes place in native forest and incorporates survey techniques for plants, small mammals and invertebrates and thus provides a good background for ecological consulting work and an introduction into large-scale project management. Students attend a week-long field course and participate in a large-scale research project as well as conducting their own research project. Emphasis is placed on critical thinking in the context of environmental management and technical skills are developed in the area of data handling and analysis, report writing and team work. Invited experts contribute to the lectures and discussions on issues relating to the ecology, conservation and management of Australia's terrestrial flora and fauna.

BIOL3909
Terrestrial Field Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3009 or BIOL2009 or BIOL2909 **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), sample and data processing (10%), research project report (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered. This unit is not offered from 2019.

This unit has the same objectives as BIOL3009 Terrestrial Field Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from applicants on the basis of previous performance. Students taking this unit of study will complete an individual research project on a topic negotiated with a member of staff. It is expected that much of the data collection will be completed during the field trip but some extra time may be needed during semester 2. Specific details of this unit of study and assessment will be announced in meetings with students at the beginning of the unit. This unit of study may be taken as part of the BSc (Advanced) program.

BIOL3029 to be developed for offering in 2019.

Cell and Developmental Biology

Study in Cell and Developmental Biology is offered by the Disciplines of Anatomy, Histology and Physiology, School of Medical Sciences, in the Sydney Medical School, as well as Developmental Biology in the School of Life and Environmental Sciences. Units of study in this major are available at standard and advanced level.

About the major

Cell and Developmental Biology aims to understand how a single cell undergoes divisions and cell differentiation to give rise to different cell and tissue types in a coordinated manner to lead to a whole organism. A comprehensive understanding of cell biology in the context of development provides a means to understand processes that lead to diseases such as cancer. Cell and Developmental Biology provides undergraduate units of study that are transdisciplinary in nature.

Requirements for completion

A major in Cell and Developmental Biology requires 48 credit points, consisting of:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level selective units
(iii)6 credit points of 2000-level core units
(iv)6 credit points of 2000-level selective units
(v)24 credit points of 3000-level selective units

A minor in Cell and Developmental Biology is available and articulates to this major.

First year

BIOL1XX7 and 6 credit points from: BIOL1XX6 or CHEM1XX1.

Second year

BIOL2X29 and 6 credit points from a selection of BCMB2X02 or GEGE2X01.

Third year

24 credit points from: HSTO3003, HSTO3004, PHSI3X10, BIOL3X26, and a 3000-level project unit.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Cell and Developmental Biology: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au

T +61 2 9036 5417

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building (F07)
Eastern Avenue
The University of Sydney NSW 2006

School of Medical Sciences
Anderson Stuart Building (F13)
Eastern Avenue
University of Sydney NSW 2006

Professor Maria Byrne
T 61-2-93515167
E maria.byrne@sydney.edu.au

Professor Frank Lovicu
T +61 2 9351 5170
E frank.lovicu@sydney.edu.au

Associate Professor Mary Byrne
T +61 2 9114 0978
E mary.byrne@sydney.edu.au

Associate Professor Stuart Fraser
T +61 2 9036 3313
E stuart.fraser@sydney.edu.au

Learning Outcomes

Students who graduate from Cell and Developmental Biology will be able to:

1. Understand cell and developmental biology and the coherence of these disciplines
2. Understand the methods in cell and developmental biology and how current knowledge in this field is both contestable and testable through further inquiry.
3. Explain the role and relevance of cell and developmental biology in society.
4. Demonstrate creativity in thinking and problem solving.
5. Appreciate the significant role of cells and development to health and the continuation of life.
6. Gather, synthesise and critically evaluate information about phenomena in cells and development from a range of sources.
7. Critically analyse observations of cells and developmental biology through proposing and testing hypotheses.
8. Design and conduct experiments in cells and development.
9. Collect, accurately record, interpret, analyse, and draw conclusions from data generated in the enquiry of cells and developmental biology.
10. Synthesise and communicate core concepts and results from enquiry in cells and development across a range of modes (including oral, written, and visual) for a variety of purposes and audiences.
11. Be accountable for their own learning by being independent and self-directed learners.
12. Work effectively, responsibly and safely in individual and peer or team contexts.
13. Demonstrate knowledge of the regulatory frameworks and ethical principles relevant to their sub-disciplinary area within cells and developmental biology, and apply these in practice.

Cell and Developmental Biology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CELL AND DEVELOPMENTAL BIOLOGY			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Cell and Developmental Biology major			
A major in Cell and Developmental Biology requires 48 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 24 credit points of 3000-level selective units			
Cell and Developmental Biology minor			
A minor in Cell and Developmental Biology requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 12 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Selective			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
2000-level units of study			
Core			
BIOL2029 **Cells**	6	**P** BIOL1XX7 or MBLG1XXX **N** BIOL2016 or BIOL2916 or BIOL2929	Semester 1
BIOL2929 **Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) **N** BIOL2016 or BIOL2916 orBIOL2029	Semester 1
Selective			
BCMB2002 **Proteins in Cells**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2902	Semester 2
BCMB2902 **Proteins in Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2002	Semester 2
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
3000-level units of study			
Selective			
HSTO3003 **Cells and Development: Theory**	6	**A** ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
HSTO3004 **Cells and Development: Practical (Adv)**	6	**A** (ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** An annual average mark of 65 or above in the previous year **C** HSTO3003 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3010 **Reproduction, Development and Disease**	6	**P** (PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02, BIOL2X29, GEGE2X01)] or [12cp from (BMED2402, BMED2403, BMED2406)] **N** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3910 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BIOL3026 **Developmental Genetics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **N** BIOL3926	Semester 2
BIOL3926 **Developmental Genetics (Advanced)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **N** BIOL3929 or BIOL3026	Semester 2
PRJT3XXX to be developed for offering in 2019.			

Cell and Developmental Biology

CELL AND DEVELOPMENTAL BIOLOGY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Cell and Developmental Biology major

A major in Cell and Developmental Biology requires 48 credit points from this table including:(i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units(iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units(v) 24 credit points of 3000-level selective units

Cell and Developmental Biology minor

A minor in Cell and Developmental Biology requires 36 credit points from this table including:(i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units(iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 12 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating

genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

Selective

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks

Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks

Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks

Please see unit outline on LMS

Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

2000-level units of study

Core

BIOL2029
Cells

Credit points: 6 **Teacher/Coordinator:** Dr Murray Thomson **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 4-hour practical per week **Prerequisites:** BIOL1XX7 or MBLG1XXX **Prohibitions:** BIOL2016 or BIOL2916 or BIOL2929 **Assessment:** 3-hour theory exam (60%), quizzes (lectures and laboratory work) (10%), marks for laboratory work (10%), report (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cell Biology is one of the most dynamic areas in science today. During development, a single cell zygote must undergo numerous divisions to become a multi-cellular organism. In both plants and animals, cell to cell communication and coordination of the cell cycle, as well as cellular division and migration, are vital for normal development. Stem cells follow specialisation pathways to become increasingly committed to differentiation, and transformation into specialised cells that group together to form the variety of tissues that make up animals and plants. In this unit you will investigate, the diversity of cell types, how these different cells interact with each other, how the cell cycle is controlled as well as studying the roles of cellular movement, differentiation and interaction in reproduction and development. In Cells you will develop a deep understanding of the established knowledge base and develop research skills to extend this knowledge. Discussions will incorporate recent advances in cell research including the regenerative potential of stem cells and their use in treatments to replace damaged and diseased tissue. The laboratory program, provides you with hands on training in key techniques such as in vitro cell culture, organelle isolation and experimentation, as well as microscopy. These skills will prepare you for a research pathway and/or a career that includes cell biology.

Textbooks

Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P. (2014) Molecular Biology of the Cell (Sixth edition). Garland Publishing Inc., New York and London (ISBN-9780815344643)

BIOL2929
Cells (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Murray Thomson **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 4-hour practical per week **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) **Prohibitions:** BIOL2016 or BIOL2916 orBIOL2029 **Assessment:** 3-hour theory exam (60%), quizzes (lectures and laboratory work) (10%), marks for laboratory work (10%), advanced report (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cell biology is one of the most dynamic areas of modern research. During development, a single cell zygote must undergo numerous divisions to become a multi-cellular organism. In both plants and animals, cell-to-cell communication and coordination of the cell cycle, as well as cellular division and migration, are vital for normal development. Stem cells follow specialisation pathways to become increasingly committed to differentiation, and transformation into specialised cells that group together to form the variety of tissues that make up animals and plants. In this unit you will investigate, the diversity of cell types, how these different cells interact with each other, how the cell cycle is controlled as well as studying the roles of cellular movement, differentiation and interaction in reproduction and development. In Cells you will develop a deep understanding of the established knowledge base and develop research skills to extend this knowledge. Discussions will incorporate recent advances in cell research including the regenerative potential of stem cells and their use in treatments to replace damaged and diseased tissue. The advanced program, will provide you with an opportunity to complete an authentic research project in a specialized area of cell biology.

Textbooks

Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P. (2014) Molecular Biology of the Cell (Sixth edition). Garland Publishing Inc., New York and London (ISBN-9780815344643)

Selective

BCMB2002
Proteins in Cells

Credit points: 6 **Teacher/Coordinator:** Dr Sandro Ataide **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; one 4-hour practical/tutorial session per week **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2071 or BCHM2971 or BCMB2902 **Assessment:** Assignments, skills-based assessment, quiz, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

A single human cell contains billions of protein molecules that are constantly in motion. Why so many? What are they doing? And, how are they doing it? In simple terms, proteins define the function of and drive almost every process within cells. In this unit of study you will learn about the biochemistry of proteins in their natural environment - within cells - with a focus on eukaryotes including plant and other cell types. You will discover the dynamic interplay within and between proteins and other cellular components and how the physical properties of proteins dictate function. You will discover how proteins are compartmentalized, modified, folded, transported in and between cells, the mechanisms by which proteins regulate biological activities, interact and transport molecules across membranes, and how mutations in proteins can lead to pathological consequences. Our practicals, other guided and online learning sessions will introduce you to a wide range of currently utilised techniques for protein biochemistry ranging from protein visualization, quantification, purification and enzymatic activity, to in silico studies and cellular targeting experiments. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the cellular and molecular biosciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2902
Proteins in Cells (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Sandro Ataide **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; one 4-hour practical/tutorial session per week **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2071 or BCHM2971 or BCMB2002 **Assessment:** Assignment, skills-based assessment, quiz, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

A single human cell contains billions of protein molecules that are constantly in motion. Why so many? What are they doing? And, how are they doing it? In simple terms, proteins define the function of and drive almost every process within cells. In this unit of study you will learn about the biochemistry of proteins in their natural environment - within cells - with a focus on eukaryotes including plant and other cell types. You will discover the dynamic interplay within and between proteins and other cellular components and how the physical properties of proteins dictate function. You will discover how proteins are compartmentalized, modified, folded, transported in and between cells, the mechanisms by which proteins regulate biological activities, interact and transport molecules across membranes, and how mutations in proteins can lead to pathological consequences. There will be a research-focused approach to the advanced practical component, including real and virtual extensions to key experiments. This approach will continue in the lecture series with several unique advanced lectures covering current research topics. You will further investigate a selected area of interest from these topics using original source material and present your findings through an oral presentation in dedicated advanced tutorials.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

GEGE2001
Genetics and Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prohibitions:** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution.

GEGE2901
Genetics and Genomics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution. The Advanced mode of Genetics and Genomics will provide you with challenge and a higher level of academic rigour. You will have the opportunity to plan and carry out a project that will develop your skills in contemporary genetics/molecular biology techniques and will provide you with a greater depth of disciplinary understanding. The Advanced mode will culminate in a written report and in an oral presentation where you will discuss a recent breakthrough that has been enabled by the use of modern genetics and genomics technologies. This is a unit for anyone wanting to better understand the how genetics has shaped the earth and how it will shape the future.

Textbooks

TBA

3000-level units of study

Selective

HSTO3003
Cells and Development: Theory

Credit points: 6 **Teacher/Coordinator:** Prof Frank Lovicu **Session:** Semester 2 **Classes:** Four to five 1-hour theory lectures and/or one 1-hour tutorial per week **Assumed knowledge:** ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 2-hour exam, tutorial research papers and Seminar (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The main emphasis of this unit of study concerns the mechanisms that control animal development. Early developmental processes including fertilisation, cleavage, and gastrulation leading to the formation of the primary germ layers and subsequent body organs are described in a range of animals, mainly vertebrates. Stem cells of both embryonic and adult origin will be covered. Emphasis will be placed on the parts played by inductive cell and tissue interactions in cell and tissue differentiation, morphogenesis and pattern formation. This will be studied at both cellular and molecular levels.

Textbooks

Gilbert, SF. Developmental Biology. 11th edition. Sinauer Associates Inc. 2016.

HSTO3004
Cells and Development: Practical (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 2 **Prerequisites:** An annual average mark of 65 or above in the previous year **Corequisites:** HSTO3003 **Assumed knowledge:** (ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Practical class reports and Seminars (100%) **Practical field work:** Two 3-hour practicals per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This advanced unit of study complements HSTO3003 (Cells and Development: Theory) and is catered to provide students with laboratory research experience leading to Honours and higher degrees. It will primarily cover the design and application of experimental procedures involved in cell and developmental biology, using appropriate molecular and cellular techniques to answer developmental questions raised in HSTO3003. This unit of study will promote hands on experience, allowing students to observe and examine developing and differentiating tissues at the macroscopic and microscopic level. The main emphasis of this unit of study will concentrate on practical approaches to understanding the mechanisms that control animal development. Some projects may examine early developmental processes such as fertilization, cleavage, gastrulation and the formation of the primary germ layers and tissues. The parts played by stem cells and inductive cell and tissue interactions in differentiation, morphogenesis and pattern formation can also be examined at cellular and molecular levels.

Textbooks

Gilbert SF. Developmental Biology. 10th edition. Sinauer Associates Inc. 2013.

PHSI3010
Reproduction, Development and Disease

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 1 **Classes:** 2 x 1hr lectures per week; 1 guest lecture/problem-based learning class introduction/organisation session per week. 2 x 3 hour problem-based learning classes per semester. **Prerequisites:** (PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02, BIOL2X29, GEGE2X01)] or [12cp from (BMED2402, BMED2403, BMED2406)] **Prohibitions:** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3910 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, two problem-solving learning tutorials, 3 practical class reports **Practical field work:** 3 x 3 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of the physiological processes that regulate normal and how these may go awry leading to significant human conditions or even disease. Lectures will focus on; male and female reproductive physiology, endocrinology of reproduction, physiology of fertilisation, cell cycle control and apoptosis, mechanisms of differentiation, gastrulation, cardiovascular development, tissue formation and organogenesis, stem cell biology and the link between developmental processes and cancer. Reprogramming and tissue regeneration will also feature in the lecture content. Problem-based learning will focus on reproductive physiology and regeneration. Practical classes will examine the processes regulating sperm function, embryogenesis and stem cell biology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

BIOL3026
Developmental Genetics

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **Prohibitions:** BIOL3926 **Assessment:** One 2-hour exam, assignments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Developmental genetics discusses major concepts and our current understanding of developmental biology with an emphasis on molecular genetics. The developmental genetics of animal and plant systems will be investigated, along with approaches used to determine gene function in relation to development of complex multicellular organisms. Topics include the features and resources for model organisms; the generation of mutants for forward and reverse genetics; the application of mutants to the study gene function and gene networks; spatial and temporal gene expression in pattern formation; quantitative trait loci analysis; utility of genome wide association studies; epigenetics in relation to inheritance; genome information in the study of human genetics. Reference will be made to the use of modern techniques in developmental biology such as transgenics, recombinant DNA technology, tissue-specific expression analysis. Various methods of genetic mapping will be covered. Practical work complements the theoretical aspects of the course and develops important skills in genetics.

BIOL3926
Developmental Genetics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **Prohibitions:** BIOL3929 or BIOL3026 **Assessment:** One 2-hour exam, assignments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components to BIOL3026 Developmental Genetics. The content and nature of these components may vary from year to year. Some assessment will be in an alternative format to components of BIOL3026.

PRJT3XXX to be developed for offering in 2019.

Chemistry

Study in the discipline of Chemistry is offered by the School of Chemistry in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

A major in Chemistry will equip you with the knowledge and understanding of molecules and processes that underpin many of the most important aspects of the natural world and new technologies. Through a detailed explanation of chemical structure and change you will be guided through advanced concepts in areas such as photosynthesis, the molecules of life, green energy technologies, new materials and the molecular underpinnings of nanotechnology.

1000-level units of study aim to provide students with an understanding of the molecular basis of the physical properties of materials, the reasons chemical reactions occur and the energy changes involved. Units are offered at different levels depending on whether chemistry was studied at the HSC level or equivalent and the results obtained.

2000-level core units Molecular Reactivity & Spectroscopy and Chemical Structure & Stability provide the mainstream chemistry essential for students planning to major in chemistry and other chemical-related sciences. Elective units in Forensic and Environmental Chemistry and in the Chemistry of Biological Molecules are also available.

3000-level units allow students to specialise in particular areas of chemistry and cover such areas as: biomolecules; organic structure and reactivity; materials; catalysis and sustainable processes; metal complexes in medicines and materials; synthetic medicinal chemistry; membranes, self-assembly and surfaces; and molecular spectroscopy and quantum theory.

Requirements for completion

A major in Chemistry requires 60 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)24 credit points of 3000-level selective units, including 1 interdisciplinary unit and 1 project unit or 1 combined interdisciplinary and project unit

A minor in Chemistry is available and articulates to this major.

First year

1000-level Chemistry is offered in two halves, Chemistry 1A (CHEM1XX1), which should be taken first, and Chemistry 1B (CHEM1XX2). Each of these is offered at four levels (Fundamentals, mainstream, Advanced, and the Special Studies Program) to suit the background and interests of students.

These units underpin the Chemistry major and will provide a solid understanding of chemical structure and reactivity. A fundamental understanding of molecules and their behaviour is also required in a wide range of other majors, from medicine to nanotechnology.

Second year

Students in 2000-level Chemistry will take one unit of core chemistry in each semester from CHEM2401/2911/2915 and CHEM2402/2912/2916. These units cover an extension of the skills and knowledge acquired in 1000-level Chemistry and provide the broad base for further specialisation in 3000-level Chemistry.

Third year

24 credit points from a selection of eight available units of study. The flexibility in third year allows students to tailor their studies to their scientific interests.

In your third year you will take at least one designated project unit and you will have the chance to explore new aspects of Chemistry in both a disciplinary and an interdisciplinary context through project and practical work.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000 level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Chemistry: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/science/chemistry/
E chemistry.enquiries@sydney.edu.au
T +61 2 9351 4504

Address:
School of Chemistry
Chemistry Building F11
University of Sydney NSW 2006

Learning Outcomes

Students who graduate from Chemistry will know:

1. Both the concepts and language of organic, inorganic, physical and theoretical chemistry.
2. How recent advances in our understanding of chemical processes contribute to our society and wellbeing (an example of Interdisciplinary Effectiveness).
3. How the various analytical tools employed in the chemical laboratory lead us to an understanding of chemical structure and mechanism.
4. The diverse themes and trends of chemical reactivity summarised by the Periodic Table.
5. Important boundaries of what is known: where existing chemical knowledge meets areas of current academic and industrial research.

Students will be able to:

1. Communicate complicated scientific concepts involving molecular structure and change through both written and oral means.
2. Solve challenging problems in Chemistry by working individually and in teams, and through consultation of the scientific literature.
3. Ask and answer scientific questions through experiment in the chemical laboratory.
4. Analyse datasets and deploy skills in computing, numeracy and data handling to obtain answers to chemical questions.
5. Critically evaluate diverse sources of chemical information and judge their relative significance.

Chemistry

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEMISTRY Advanced coursework and projects will be available in 2020 for students who complete this major.			
Chemistry major A major in Chemistry requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 24 credit points of 3000-level selective units, including 1 interdisciplinary unit and 1 project unit or 1 combined interdisciplinary and project unit			
Chemistry minor A minor in Chemistry requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
CHEM1012 **Fundamentals of Chemistry 1B**	6	**P** CHEM1XX1 **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992	Semester 2
CHEM1112 **Chemistry 1B**	6	**P** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992	Semester 1 Semester 2
CHEM1912 **Chemistry 1B (Advanced)**	6	**P** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 *Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.*	Semester 2
CHEM1992 **Chemistry 1B (Special Studies Program)**	6	**P** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 *Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
2000-level units of study			
Core			
CHEM2401 **Molecular Reactivity and Spectroscopy**	6	**A** 6cp MATH1XXX **P** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 or CHEM2915 *This is a required chemistry unit of study for students intending to major in chemistry.*	Semester 1
CHEM2911 **Molecular Reactivity and Spectroscopy Adv**	6	**A** 6cp MATH1XXX **P** (A mark of 65 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 65 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2915	Semester 1
CHEM2915 **Molecular Reactivity and Spectroscopy SSP**	6	**A** 6cp MATH1XXX **P** (A mark of 75 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 75 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 *Note: Department permission required for enrolment* *The number of places in this unit of study is strictly limited and entry is by invitation only. Enrolment is conditional upon available places.*	Semester 1
CHEM2402 **Chemical Structure and Stability**	6	**A** 6cp MATH1XXX **P** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **N** CHEM2202 or CHEM2302 or CHEM2902 or CHEM2912 or CHEM2916 *This is a required chemistry unit of study for students intending to major in chemistry.*	Semester 2
CHEM2912 **Chemical Structure and Stability (Adv)**	6	**A** 6cp MATH1XXX **P** (A mark of 65 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 65 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **N** CHEM2202 or CHEM2302 or CHEM2402 or CHEM2902 or CHEM2916	Semester 2
CHEM2916 **Chemical Structure and Stability (SSP)**	6	**A** 6cp MATH1XXX **P** (A mark of 75 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 75 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **N** CHEM2202 or CHEM2302 or CHEM2402 or CHEM2902 or CHEM2912 *Note: Department permission required for enrolment* *The number of places in this unit of study is strictly limited and entry is by invitation only. Enrolment is conditional upon available places.*	Semester 2
3000-level units of study			
Selective			
CHEM3XX0, CHEM3XX1, CHEM3XX2, CHEM3XX3, CHEM3XX4, CHEM3XX5, CHEM3XX6, CHEM3XX7 to be developed for offering in 2019.			

Chemistry

CHEMISTRY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Chemistry major

A major in Chemistry requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 24 credit points of 3000-level selective units, including 1 interdisciplinary unit and 1 project unit or 1 combined interdisciplinary and project unit

Chemistry minor

A minor in Chemistry requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic

orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1012
Fundamentals of Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1XX1 **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Fundamentals of Chemistry 1B is built on a satisfactory prior knowledge of Fundamentals of Chemistry 1A. Compared to the mainstream Chemistry 1B, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1112
Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2 **Classes:** 1x3-hr lecture; 1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviours, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do we develop lotions that don't burn us, how do we measure UV absorption by sunscreens, how can we measure and alter soil pH, how are sticky things made, and how do we determine the concentration of vitamin C in juice? Through enquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B is built on a satisfactory prior knowledge of Chemistry 1A.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1912
Chemistry 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B (Advanced) is built on a satisfactory prior knowledge of Chemistry 1A (Advanced). Compared to the mainstream Chemistry 1B, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1992
Chemistry 1B (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 12 weeks **Prerequisites:** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 **Assessment:** quizzes, assignment, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how food and medicines work, the properties of materials and substances. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as a demonstrated aptitude. Chemistry 1B (Special Studies Program) is restricted to students who have gained a Distinction in Chemistry 1A (Special Studies Program) or by invitation. The practical work syllabus for Chemistry 1B (Special Studies Program) is very different from that for Chemistry 1B and Chemistry 1B (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1B (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

2000-level units of study

Core

CHEM2401
Molecular Reactivity and Spectroscopy

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 1 **Classes:** Three 1-hour lectures per week, seven 1-hour tutorials per semester, eight 4-hour practicals per semester **Prerequisites:** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **Prohibitions:** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 or CHEM2915 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a required chemistry unit of study for students intending to major in chemistry.

This is one of the two core units of study for students considering majoring in chemistry, and for students of other disciplines who wish to acquire a good general background in chemistry. The unit considers fundamental questions of molecular structure, chemical reactivity, and molecular spectroscopy: What are chemical reactions and what makes them happen? How can we follow and understand them? How can we exploit them to make useful molecules? This course includes the organic and medicinal chemistry of aromatic and carbonyl compounds, organic reaction mechanisms, molecular spectroscopy, quantum chemistry, and molecular orbital theory.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2911
Molecular Reactivity and Spectroscopy Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 1 **Classes:** Three 1-hour lectures per week, seven 1-hour tutorials per semester and eight 4-hour practicals per semester **Prerequisites:** (A mark of 65 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 65 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **Prohibitions:** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2915 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The syllabus for this unit is the same as that of CHEM2401 together with special Advanced material presented in the practical program. The lectures cover fundamental consideration of molecular electronic structure and its role in molecular reactivity and spectroscopy and include applications of spectroscopy, the organic chemistry of aromatic systems, molecular orbital theory and quantum chemistry. For more details of the lecture syllabus, please read the entry for CHEM2401.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2915
Molecular Reactivity and Spectroscopy SSP

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 1 **Classes:** Three 1-hour lectures per week, twelve 1-hour SSP seminars per semester, eight 4-hour practicals per semester **Prerequisites:** (A mark of 75 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 75 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **Prohibitions:** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, assignments, lab reports and final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: The number of places in this unit of study is strictly limited and entry is by invitation only. Enrolment is conditional upon available places.

The lectures for this unit comprise the lectures for CHEM2401 and the Advanced practical program together with additional SSP seminars.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2402
Chemical Structure and Stability

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 2 **Classes:** Three 1-hour lectures per week, seven 1-hour tutorials per semester, eight 4-hour practicals per semester **Prerequisites:** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **Prohibitions:** CHEM2202 or CHEM2302 or CHEM2902 or CHEM2912 or CHEM2916 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a required chemistry unit of study for students intending to major in chemistry.

This is the second core unit of study for students considering majoring in chemistry, and for students seeking a good general background in chemistry. The unit continues the consideration of molecular structure and chemical reactivity. Topics include the structure and bonding of inorganic compounds, the properties of metal complexes, materials chemistry and nanotechnology, thermodynamics and kinetics.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2912
Chemical Structure and Stability (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 2 **Classes:** Three 1-hour lectures per week, seven 1-hour tutorials per semester, eight 4-hour practicals per semester **Prerequisites:** (A mark of 65 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 65 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **Prohibitions:** CHEM2202 or CHEM2302 or CHEM2402 or CHEM2902 or CHEM2916 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The syllabus for this unit is the same as that of CHEM2402 together with special Advanced material presented in the practical program. The lectures include the properties of inorganic compounds and complexes, statistical thermodynamics, the chemistry of carbonyls, nucleophilic organometallic reagents, and synthetic methods. For more details of the lecture syllabus, please read the entry for CHEM2402.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2916
Chemical Structure and Stability (SSP)

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 2 **Classes:** Three 1-hour lectures per week, twelve 1-hour SSP seminars per semester, eight 4-hour practicals per semester **Prerequisites:** (A mark of 75 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 75 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **Prohibitions:** CHEM2202 or CHEM2302 or CHEM2402 or CHEM2902 or CHEM2912 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, assignments, lab reports and final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: The number of places in this unit of study is strictly limited and entry is by invitation only. Enrolment is conditional upon available places.

The lectures for this unit comprise the lectures for CHEM2402 and the Advanced practical program together with additional SSP seminars comprising three seminar series on state of the art topics in chemistry.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

3000-level units of study

Selective

CHEM3XX0, CHEM3XX1, CHEM3XX2, CHEM3XX3, CHEM3XX4, CHEM3XX5, CHEM3XX6, CHEM3XX7 to be developed for offering in 2019.

Computer Science

The School of Information Technologies aims to teach fundamental principles and practical skills in IT, and to establish the foundations for an entire career. Units of study in the Computer Science major are available at standard and advanced level.

About the major

A major in computer science covers the key concepts of computation. You will learn the principles and techniques needed to solve tasks efficiently with computation, and how to express those solutions in software. You will also discover how computation can be modelled and how to reason about the limits of what computation can achieve.

A major in computer science will provide you with the knowledge and skills needed to innovate in information technology, and create fundamentally new IT solutions to future challenges.

Requirements for completion

A major in Computer Science requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)18 credit points of 2000-level core units
(iii)12 credit points of 3000-level core units
(iv)6 credit points of 3000-level selective units

A minor in Computer Science is available and articulates to this major.

First year

Core: INFO1110 and INFO1113.

Second year

Core: COMP2X23, COMP2017, COMP2X22.

Third year

COMP3615/3600 and COMP3X27 and 6 credit points from a selection of COMP3221, COMP3308, COMP3608, COMP3419, COMP3520.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Computer Science: completion of 24 credit points of project work and 24 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W https://sydney.edu.au/engineering/about/school-of-information-technologies.html
E info@it.usyd.edu.au
T +61 2 9351 3423

Address:
School of Information Technologies J12
University of Sydney NSW 2006

Dr Josiah Poon
T +61 2 9351 7185
E josiah.poon@sydney.edu.au

Learning Outcomes

Students who graduate from Computer Science will be able to:

1. Acquire knowledge of the fundamental mathematical properties of computer hardware, software, and certain applications thereof.
2. Find efficient solutions to a wide range of computational tasks, by applying known data structures and algorithms, or by designing new algorithms using a range of algorithm design techniques; and able to produce runnable implementations of these solutions.
3. Reason the correctness and efficiency of algorithms (both standard ones and novel ones).
4. Acquire knowledge of key ideas from the theory of computation and its limits, and ability to recognize tasks where efficient perfect solutions should not be expected, and where approximate solutions are appropriate.
5. Learn basic knowledge of the hardware & software stack including computer architecture, operating systems, programming languages, databases, and networking.

Computer Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMPUTER SCIENCE			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Computer Science major			
A major in Computer Science requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units			
Computer Science minor			
A minor in Computer Science requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 6 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
INFO1110 **Introduction to Programming**	6		Intensive July Semester 1 Semester 2
INFO1113 **Object-Oriented Programming**	6	**P** INFO1110 **N** INFO1103 OR INFO1105 OR INFO1905	Semester 1 Semester 2
2000-level units of study			
Core			
COMP2123 **Data Structures and Algorithms**	6	**P** INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **N** INFO1105 OR INFO1905 OR COMP2823	Semester 1
COMP2823 **Data Structures and Algorithms (Adv)**	6	**P** Distinction level result in at least one of INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **N** INFO1105 OR INFO1905 OR COMP2123 *Note: Department permission required for enrolment*	Semester 1
COMP2017 **Systems Programming**	6	**P** INFO1113 OR INFO1105 OR INFO1905 OR INFO1103 **C** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **N** COMP2129	Semester 1
COMP2022 **Programming Languages, Logic and Models**	6	**A** MATH1004 OR MATH1904 OR MATH1064 OR MATH2069 OR MATH2969 **P** INFO1103 OR INFO1903 OR INFO1113 **N** COMP2922	Semester 2
COMP2922 **Programming Languages, Logic and Models (Adv)**	6	**A** MATH1004 OR MATH1904 OR MATH1064 OR MATH2069 OR MATH2969 **P** Distinction level result in INFO1103 OR INFO1903 OR INFO1113 **N** COMP2022 *Note: Department permission required for enrolment*	Semester 2
3000-level units of study			
Core			
COMP3600 **Computer Science Project (Adv)**	6	**P** (COMP2123 OR COMP2823) AND COMP2017 AND (COMP2022 OR COMP2922) with Distinction level results in at least one of the above listed units **N** INFO3600 OR COMP3615 *Note: Department permission required for enrolment*	Semester 2
COMP3615 **Computer Science Project**	6	**P** (COMP2123 OR COMP2823) AND COMP2017 AND (COMP2022 OR COMP2922) **N** INFO3600 OR COMP3600 *Note: Department permission required for enrolment*	Semester 2
COMP3027 **Algorithm Design**	6	**A** MATH1004 OR MATH1904 OR MATH1064 **P** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **N** COMP2007 OR COMP2907 OR COMP3927	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP3927 **Algorithm Design (Adv)**	6	**A** MATH1004 OR MATH1904 OR MATH1064 **P** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **N** COMP2007 OR COMP2907 OR COMP3027 *Note: Department permission required for enrolment*	Semester 1
Major selective			
COMP3221 **Distributed Systems**	6	**P** (INFO1105 OR INFO1905) OR ((INFO1103 OR INFO1113) AND (COMP2123 OR COMP2823)) **N** COMP2121	Semester 1
COMP3308 **Introduction to Artificial Intelligence**	6	**A** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **N** COMP3608	Semester 1
COMP3608 **Introduction to Artificial Intelligence (Adv)**	6	**A** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **P** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **N** COMP3308 *COMP3308 and COMP3608 share the same lectures, but have different tutorials and assessment (the same type but more challenging).*	Semester 1
COMP3419 **Graphics and Multimedia**	6	**A** Programming skills **P** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905	Semester 2
COMP3520 **Operating Systems Internals** *This unit of study is not available in 2018*	6	**P** COMP2129	Semester 1
Minor selective			
COMP3027 **Algorithm Design**	6	**A** MATH1004 OR MATH1904 OR MATH1064 **P** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **N** COMP2007 OR COMP2907 OR COMP3927	Semester 1
COMP3927 **Algorithm Design (Adv)**	6	**A** MATH1004 OR MATH1904 OR MATH1064 **P** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **N** COMP2007 OR COMP2907 OR COMP3027 *Note: Department permission required for enrolment*	Semester 1
COMP3221 **Distributed Systems**	6	**P** (INFO1105 OR INFO1905) OR ((INFO1103 OR INFO1113) AND (COMP2123 OR COMP2823)) **N** COMP2121	Semester 1
COMP3308 **Introduction to Artificial Intelligence**	6	**A** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **N** COMP3608	Semester 1
COMP3608 **Introduction to Artificial Intelligence (Adv)**	6	**A** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **P** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **N** COMP3308 *COMP3308 and COMP3608 share the same lectures, but have different tutorials and assessment (the same type but more challenging).*	Semester 1
COMP3419 **Graphics and Multimedia**	6	**A** Programming skills **P** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905	Semester 2
COMP3520 **Operating Systems Internals** *This unit of study is not available in 2018*	6	**P** COMP2129	Semester 1

Computer Science

COMPUTER SCIENCE

Advanced coursework and projects will be available in 2020 for students who complete this major.

Computer Science major

A major in Computer Science requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 18 credit points of 2000-level core units(iii) 12 credit points of 3000-level core units(iv) 6 credit points of 3000-level selective units

Computer Science minor

A minor in Computer Science requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 18 credit points of 2000-level core units(iii) 6 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

INFO1110
Introduction to Programming

Credit points: 6 **Session:** Intensive July, Semester 1, Semester 2 **Classes:** lectures, laboratories, seminars **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an essential starting point for software developers, IT consultants, and computer scientists to build their understanding of principle computer operation. Students will obtain knowledge and skills with procedural programming. Crucial concepts include defining data types, control flow, iteration, functions, recursion, the model of addressable memory. Students will be able to reinterpret a general problem into a computer problem, and use their understanding of the computer model to develop source code. This unit trains students with software development process, including skills of testing and debugging. It is a prerequisite for more advanced programming languages, systems programming, computer security and high performance computing.

INFO1113
Object-Oriented Programming

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** lectures, laboratories, seminars **Prerequisites:** INFO1110 **Prohibitions:** INFO1103 OR INFO1105 OR INFO1905 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Object-oriented (OO) programming is a technique that arranges code into classes, each encapsulating in one place related data and the operations on that data. Inheritance is used to reuse code from a more general class, in specialised situations. Most modern programming languages provide OO features. Understanding and using these are an essential skill to software developers in industry. This unit provides the student with the concepts and individual programming skills in OO programming, starting from their previous mastery of procedural programming.

2000-level units of study

Core

COMP2123
Data Structures and Algorithms

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **Prohibitions:** INFO1105 OR INFO1905 OR COMP2823 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will teach some powerful ideas that are central to solving algorithmic problems in ways that are more efficient than naive approaches. In particular, students will learn how data collections can support efficient access, for example, how a dictionary or map can allow key-based lookup that does not slow down linearly as the collection grows in size. The data structures covered in this unit include lists, stacks, queues, priority queues, search trees, hash tables, and graphs. Students will also learn efficient techniques for classic tasks such as sorting a collection. The concept of asymptotic notation will be introduced, and used to describe the costs of various data access operations and algorithms.

COMP2823
Data Structures and Algorithms (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** Distinction level result in at least one of INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **Prohibitions:** INFO1105 OR INFO1905 OR COMP2123 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will teach some powerful ideas that are central to solving algorithmic problems in ways that are more efficient than naive approaches. In particular, students will learn how data collections can support efficient access, for example, how a dictionary or map can allow key-based lookup that does not slow down linearly as the collection grows in size. The data structures covered in this unit include lists, stacks, queues, priority queues, search trees, hash tables, and graphs. Students will also learn efficient techniques for classic tasks such as sorting a collection. The concept of asymptotic notation will be introduced, and used to describe the costs of various data access operations and algorithms.

COMP2017
Systems Programming

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, laboratories **Prerequisites:** INFO1113 OR INFO1105 OR INFO1905 OR INFO1103 **Corequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Prohibitions:** COMP2129 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this unit of study, elementary methods for developing robust, efficient, and re-usable software will be covered. The unit is taught in C, in a Unix environment. Specific coding topics include memory management, the pragmatic aspects of implementing data structures such as lists and hash tables and managing concurrent threads. Debugging tools and techniques are discussed and common programming errors are considered along with defensive programming techniques to avoid such errors. Emphasis is placed on using common Unix tools to manage aspects of the software construction process, such as version control and regression testing. The subject is taught from a practical viewpoint and it includes a considerable amount of programming practice.

COMP2022
Programming Languages, Logic and Models

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials **Prerequisites:** INFO1103 OR INFO1903 OR INFO1113 **Prohibitions:** COMP2922 **Assumed knowledge:** MATH1004 OR MATH1904 OR MATH1064 OR MATH2069 OR MATH2969 **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to the foundations of computational models, and their connection to programming languages/tools. The unit covers various abstract models for computation including Lambda Calculus, and Logic calculi (e. g. concept of formal proofs in propositional, predicate, and temporal logic). For each abstract model, we introduce programming languages/tools that are built on the introduced abstract computational models. We will discuss functional languages including Scheme/Haskell, and Prolog/Datalog.

COMP2922
Programming Languages, Logic and Models (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** lectures, tutorials **Prerequisites:** Distinction level result in INFO1103 OR INFO1903 OR INFO1113 **Prohibitions:** COMP2022 **Assumed knowledge:** MATH1004 OR MATH1904 OR MATH1064 OR MATH2069 OR MATH2969 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit provides an introduction to the foundations of computational models, and their connection to programming languages/tools. The unit covers various abstract models for computation including Lambda Calculus, and Logic calculi (e.g. concept of formal proofs in propositional, predicate, and temporal logic). For each abstract model, we introduce programming languages/tools that are built on the introduced abstract computational models. We will discuss functional languages including Scheme/Haskell, and Prolog/Datalog.

3000-level units of study

Core

COMP3600
Computer Science Project (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** project work, sites visits, meetings **Prerequisites:** (COMP2123 OR COMP2823) AND COMP2017 AND (COMP2022 OR COMP2922) with Distinction level results in at least one of the above listed units **Prohibitions:** INFO3600 OR COMP3615 **Assessment:** through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will provide students an opportunity to apply the knowledge and practise the skills acquired in the prerequisite and qualifying units, in the context of designing and building a substantial software development system in diverse application domains including life sciences. Working in groups for an external client combined with academic supervision, students will need to carry out the full range of activities including requirements capture, analysis and design, coding, testing and documentation. Students will use the XP methodology and make use of professional tools for the management of their project.

COMP3615
Computer Science Project

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work, Site Visit, Meetings **Prerequisites:** (COMP2123 OR COMP2823) AND COMP2017 AND (COMP2022 OR COMP2922) **Prohibitions:** INFO3600 OR COMP3600 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will provide students an opportunity to apply the knowledge and practise the skills acquired in the prerequisite and qualifying units, in the context of designing and building a substantial software development system in diverse application domains including life sciences. Working in groups for an external client combined with academic supervision, students will need to carry out the full range of activities including requirements capture, analysis and design, coding, testing and documentation. Students will use the XP methodology and make use of professional tools for the management of their project.

COMP3027
Algorithm Design

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Prohibitions:** COMP2007 OR COMP2907 OR COMP3927 **Assumed knowledge:** MATH1004 OR MATH1904 OR MATH1064 **Assessment:** through semester assessment (40%), final exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to the design techniques that are used to find efficient algorithmic solutions for given problems. The techniques covered included greedy, divide-and-conquer, dynamic programming, and adjusting flows in networks. Students will extend their skills in algorithm analysis. The unit also provides an introduction to the concepts of computational complexity and reductions between problems.

COMP3927
Algorithm Design (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Prohibitions:** COMP2007 OR COMP2907 OR COMP3027 **Assumed knowledge:** MATH1004 OR MATH1904 OR MATH1064 **Assessment:** through semester assessment (40%), final exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit provides an introduction to the design techniques that are used to find efficient algorithmic solutions for given problems. The techniques covered included greedy, divide-and-conquer, dynamic programming, and adjusting flows in networks. Students will extend their skills in algorithm analysis. The unit also provides an introduction to the concepts of computational complexity and reductions between problems.

Major selective

COMP3221
Distributed Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** (INFO1105 OR INFO1905) OR ((INFO1103 OR INFO1113) AND (COMP2123 OR COMP2823)) **Prohibitions:** COMP2121 **Assessment:** through semester assessment (60%), final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide broad introduction to the principles of distributed computing and distributed systems and their design; provide students the fundamental knowledge required to analyse, design distributed algorithms and implement various types of applications, like blockchains; explain the common algorithmic design principles and approaches used in the design of message passing at different scales (e.g., logical time, peer-to-peer overlay, gossip-based communication).

COMP3308
Introduction to Artificial Intelligence

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorials, Lectures **Prohibitions:** COMP3608 **Assumed knowledge:** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **Assessment:** Through semester assessment (45%) and Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Artificial Intelligence (AI) is all about programming computers to perform tasks normally associated with intelligent behaviour. Classical AI programs have played games, proved theorems, discovered patterns in data, planned complex assembly sequences and so on. This unit of study will introduce representations, techniques and architectures used to build intelligent systems. It will explore selected topics such as heuristic search, game playing, machine learning, neural networks and probabilistic reasoning. Students who complete it will have an understanding of some of the fundamental methods and algorithms of AI, and an appreciation of how they can be applied to interesting problems. The unit will involve a practical component in which some simple problems are solved using AI techniques.

COMP3608
Introduction to Artificial Intelligence (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **Prohibitions:** COMP3308 **Assumed knowledge:** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **Assessment:** Through semester assessment (45%) and Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: COMP3308 and COMP3608 share the same lectures, but have different tutorials and assessment (the same type but more challenging).

An advanced alternative to COMP3308; covers material at an advanced and challenging level.

COMP3419
Graphics and Multimedia

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials **Prerequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Assumed knowledge:** Programming skills **Assessment:** Through semester assessment (40%) and Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides a broad introduction to the field of graphics and multimedia computing to meet the diverse requirements of application areas such as entertainment, industrial design, virtual reality, intelligent media management, social media and remote sensing. It covers both the underpinning theories and the practices of computing and manipulating digital media including graphics / image, audio, animation, and video. Emphasis is placed on principles and cutting-edge techniques for multimedia data processing, content analysis, media retouching, media coding and compression.

COMP3520
Operating Systems Internals

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** COMP2129 **Assessment:** Through semester assessment (40%) and Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive discussion of relevant OS issues and principles and describe how those principles are put into practice in real operating systems. The contents include internal structure of OS; several ways each major aspect (process scheduling, inter-process communication, memory management, device management, file systems) can be implemented; the performance impact of design choices; case studies of common OS (Linux, MS Windows NT, etc.).

Minor selective

COMP3027
Algorithm Design

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Prohibitions:** COMP2007 OR COMP2907 OR COMP3927 **Assumed knowledge:** MATH1004 OR MATH1904 OR MATH1064 **Assessment:** through semester assessment (40%), final exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to the design techniques that are used to find efficient algorithmic solutions for given problems. The techniques covered included greedy, divide-and-conquer, dynamic programming, and adjusting flows in networks. Students will extend their skills in algorithm analysis. The unit also provides an introduction to the concepts of computational complexity and reductions between problems.

COMP3927
Algorithm Design (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Prohibitions:** COMP2007 OR COMP2907 OR COMP3027 **Assumed knowledge:** MATH1004 OR MATH1904 OR MATH1064 **Assessment:** through semester assessment (40%), final exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit provides an introduction to the design techniques that are used to find efficient algorithmic solutions for given problems. The techniques covered included greedy, divide-and-conquer, dynamic programming, and adjusting flows in networks. Students will extend their skills in algorithm analysis. The unit also provides an introduction to the concepts of computational complexity and reductions between problems.

COMP3221
Distributed Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** (INFO1105 OR INFO1905) OR ((INFO1103 OR INFO1113) AND (COMP2123 OR COMP2823)) **Prohibitions:** COMP2121 **Assessment:** through semester assessment (60%), final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide broad introduction to the principles of distributed computing and distributed systems and their design; provide students the fundamental knowledge required to analyse, design distributed algorithms and implement various types of applications, like blockchains; explain the common algorithmic design principles and approaches used in the design of message passing at different scales (e.g., logical time, peer-to-peer overlay, gossip-based communication).

COMP3308
Introduction to Artificial Intelligence

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorials, Lectures **Prohibitions:** COMP3608 **Assumed knowledge:** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **Assessment:** Through semester assessment (45%) and Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Artificial Intelligence (AI) is all about programming computers to perform tasks normally associated with intelligent behaviour. Classical AI programs have played games, proved theorems, discovered patterns in data, planned complex assembly sequences and so on. This unit of study will introduce representations, techniques and architectures used to build intelligent systems. It will explore selected topics such as heuristic search, game playing, machine learning, neural networks and probabilistic reasoning. Students who complete it will have an understanding of some of the fundamental methods and algorithms of AI, and an appreciation of how they can be applied to interesting problems. The unit will involve a practical component in which some simple problems are solved using AI techniques.

COMP3608
Introduction to Artificial Intelligence (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **Prohibitions:** COMP3308 **Assumed knowledge:** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **Assessment:** Through semester assessment (45%) and Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: COMP3308 and COMP3608 share the same lectures, but have different tutorials and assessment (the same type but more challenging).

An advanced alternative to COMP3308; covers material at an advanced and challenging level.

COMP3419
Graphics and Multimedia

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials **Prerequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Assumed knowledge:** Programming skills **Assessment:** Through semester assessment (40%) and Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides a broad introduction to the field of graphics and multimedia computing to meet the diverse requirements of application areas such as entertainment, industrial design, virtual reality, intelligent media management, social media and remote sensing. It covers both the underpinning theories and the practices of computing and manipulating digital media including graphics / image, audio, animation,

and video. Emphasis is placed on principles and cutting-edge techniques for multimedia data processing, content analysis, media retouching, media coding and compression.

COMP3520
Operating Systems Internals

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** COMP2129 **Assessment:** Through semester assessment (40%) and Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive discussion of relevant OS issues and principles and describe how those principles are put into practice in real operating systems. The contents include internal structure of OS; several ways each major aspect (process scheduling, inter-process communication, memory management, device management, file systems) can be implemented; the performance impact of design choices; case studies of common OS (Linux, MS Windows NT, etc.).

Data Science

Study in the discipline of Data Science is jointly offered by the School of Mathematics and Statistics in the Faculty of Science and the School of Information Technologies in the Faculty of Engineering and Information Technologies. Units of study in this major are available at standard and advanced level.

About the major

Data is an essential asset in many organisations as it enables informed decision making into many areas including market intelligence and science. In the major in Data Science, you will learn computational and analytical skill sets that stem from statistics and computer science, to manage, interpret, understand, analyse and derive key knowledge from the data.

You will develop critical thinking about data and its use, a deep understanding of the core technical skills required and an appreciation for the context in which that data was collected. At the 3000-level of study and beyond, you will develop the ability to understand problems from many disciplines and place a data-driven problem into an analytical framework, solve the problem through computational means, interpret the results and communicate them to clients or collaborators.

Requirements for completion

A major in Data Science requires 48 credit points, consisting of:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level units according to one of the following rules:
(a)6 credit points of selective units, or
(b)3 credit points of statistics units and 3 credit points of computations units, or
(c)3 credit points of advanced statistics and 3 credit points of calculus and linear algebra units
(iii)12 credit points of 2000-level core units
(iv)6 credit points of 2000-level selective units
(v)6 credit points of 3000-level interdisciplinary project units
(vi)6 credit points of 3000-level methodology-focussed units
(vii)6 credit points of 3000-level methodology or application and discipline-focussed units

A minor in Data Science is available and articulates to this major.

First year

DATA1001 Foundations of Data Science is a foundational unit in the Data Science major. The unit focuses on developing critical and statistical thinking skills for all students.

DATA1002 Informatics: Data and Computation is a foundational unit in the Data Science major. This unit covers computation and data handling, integrating sophisticated use of existing productivity software, e.g. spreadsheets, with the development of custom software using the general-purpose Python language.

Students are strongly encouraged to take DATA1001 and DATA1002 for this major. However, there are some equivalent selective units for DATA1001 and students can choose from: ENVX1002, MATH1005, MATH1015, MATH1115, MATH1905, MATH1021, MATH1921, MATH1931, MATH1023, MATH1923, MATH1933, MATH1002, MATH1902. Students should refer to Table A for specific 1000-level requirements.

Second year

DATA2001 – Data Science: Scale and Data Diversity focuses on methods and techniques to efficiently explore and analyse large data collections;

DATA2002 – Data Analytics: Learning from Data focuses on developing data analytic skills for a wide range of problems and data.

Students also complete one unit from a selection: COMP2123, COMP2823, STAT2X11, QBUS2830.

Third year

DATA3001 – Interdisciplinary Data Science Project is the capstone 3000-level unit for the major and will include both the disciplinary and interdisciplinary project. The main component for the unit will be a nine week project that applies the candidates' skills and knowledge to analyse a real, messy dataset from a knowledge domain outside data science and statistics.

Students will also select 6 credit points from a selection of DATA and STAT units focusing on methodology, and 6 credit points from a selection of methodology or application and discipline-focussed units.

Note that the following units will also be available in 2019 at 3000-level: COMP3308, COMP3027, COMP3608, COMP3927.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Data Science: completion of 24 credit points of project work and 24 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W www.maths.usyd.edu.au/
E firstyear@maths.usyd.edu.au
All enquiries phone: +61 2 9351 5804 or +61 2 9351 5787

Address:
School of Mathematics and Statistics
Level 5, Carslaw Building F07
University of Sydney NSW 2006

Professor Jean Yang
T +61 2 9351 3012
E jean.yang@sydney.edu.au

Learning Outcomes

Students who graduate from Data Science will be able to demonstrate:

Interdisciplinary Skills

1. Ability to engage with problems from many diverse areas of application and to understand the relationships between a given problem and data collected to solve the problem.
2. Ability to relate context specific knowledge to data, to understand how data can be used to generate context specific knowledge, and know how this knowledge can guide data analytics.

Foundational Understanding

1. Understanding of the importance of experimental design, its relationship with data output, and how this data should be analysed and evaluated, including potential pitfalls.
2. Ability to identify, at a general level, the type of data analytical approach required for a particular problem; whether that is data analysis, simulation based modelling or equation-based modelling.
3. Understanding of how the data context, organizational constraints and quality issues have implications for flow-on impacts in further stages of the analysis.

Data Science Methods and Tools

1. Skills in data management with an understanding of how data, metadata, and derived knowledge (including analytical models) are stored, accessed, and administered.
2. A range of computational skills including programming, choosing scientific data formats, creating and using databases (for storing and accessing metadata) and use of graphical information systems (for mapping and sharing high dimensional data). These skills also include understanding the principles of programming and the ability to translate this knowledge to new computational code and to create tools.
3. Data analytical competencies that include, but are not limited to, the use appropriate of quantitative models or visualisation methods on multiple data types to:

- enable prediction of outcome
- recognise significant patterns and trends
- critically assess the strengths and weaknesses of different analytical approaches.

Communication Skills

1. Ability and experience to confidently use one's data analytical competency to communicate discipline-specific outcomes in written and verbal form, and for decision making.

Problem Awareness

1. An awareness of data integrity issues including appreciation of data privacy and ethical issues.
2. General understanding of how data analytical tools can be automated and implemented efficiently and up-scaled if necessary using the available technologies.

Data Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
DATA SCIENCE			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Data Science major			
A major in Data Science requires 48 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level units according to the following rules*: (a) 6 credit points of selective units (b) 3 credit points of statistics units and 3 credit points of computations units (c) 3 credit points of advanced statistics units and 3 credit points of calculus and linear algebra units (iii) 12 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 6 credit points of 3000-level interdisciplinary project units (vi) 6 credit points of 3000-level methodology-focussed units (vii) 6 credit points of 3000-level methodology or application and discipline-focussed units			
Additional application and discipline-focussed units will be available in 2019 in discipline areas including functional genomics, animal genetics/bioinformatics, geoscience /hydrology modelling. *Students not enrolled in the BSc may substitute ECMT1010 or BUSS1020			
Data Science minor			
A minor in Data Science requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level units according to the following rules*: (a) 6 credit points of selective units (b) 3 credit points of statistics units and 3 credit points of computations units (c) 3 credit points of advanced statistics units and 3 credit points of calculus and linear algebra units (iii) 12 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 6 credit points of 3000-level methodology-focussed units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
DATA1002 **Informatics: Data and Computation**	6	**N** INFO1903	Semester 2
Selective			
DATA1001 **Foundations of Data Science**	6	**N** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021	Semester 1 Semester 2
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
Statistics units			
MATH1005 **Statistical Thinking with Data**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020	Semester 2 Summer Main Winter Main
MATH1015 **Biostatistics**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020	Semester 1
Computation units			
MATH1115 **Interrogating Data**	3	**P** MATH1005 or MATH1015 **N** DATA1001 or STAT1021 or ECMT1010 or ENVX1001 or BUSS1020 or ENVX1002 or MATH1905	Semester 1 Semester 2 Winter Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Advanced Statistics units			
MATH1905 **Statistical Thinking with Data (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 *Note: Department permission required for enrolment*	Semester 2
Maths units			
MATH1021 **Calculus Of One Variable**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931	Semester 1
MATH1921 **Calculus Of One Variable (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 *Note: Department permission required for enrolment*	Semester 1
MATH1931 **Calculus Of One Variable (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 1
MATH1023 **Multivariable Calculus and Modelling**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933	Semester 2
MATH1923 **Multivariable Calculus and Modelling (Adv)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 *Note: Department permission required for enrolment*	Semester 2
MATH1933 **Multivariable Calculus and Modelling (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 2
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1012 or MATH1014 or MATH1902	Semester 1 Summer Main
MATH1902 **Linear Algebra (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1002 or MATH1012 or MATH1014 *Note: Department permission required for enrolment*	Semester 1
*Students not enrolled in BSc – Substitute units			
2000-level units of study			
Core			
DATA2001 **Data Science: Big Data and Data Diversity**	6	**P** DATA1002 OR INFO1110 OR INFO1903 OR INFO1103	Semester 1
DATA2002 **Data Analytics: Learning from Data**	6	**A** (Basic Linear Algebra and some coding) or QBUS1040 **P** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **N** STAT2012 or STAT2912	Semester 2
Selective			
COMP2123 **Data Structures and Algorithms**	6	**P** INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **N** INFO1105 OR INFO1905 OR COMP2823	Semester 1
COMP2823 **Data Structures and Algorithms (Adv)**	6	**P** Distinction level result in at least one of INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **N** INFO1105 OR INFO1905 OR COMP2123 *Note: Department permission required for enrolment*	Semester 1
ISYS2120 **Data and Information Management**	6	**A** Programming skills **P** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 OR INFO1003 OR INFO1903 OR DECO1012 **N** INFO2120 OR INFO2820 OR COMP5138	Semester 2
STAT2011 **Probability and Estimation Theory**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **N** STAT2901 or STAT2001 or STAT2911	Semester 1
STAT2911 **Probability and Statistical Models (Adv)**	6	**P** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **N** STAT2001 or STAT2901 or STAT2011	Semester 1
QBUS2830 **Actuarial Data Analytics**	6	**A** BUSS1020 or ECMT1010 or ENVX1001 or ENVX1002 or ((MATH1005 or MATH1015) and MATH1115) or 6 credit points in MATH 1000-level units including MATH1905. **P** QBUS2810 or DATA2002 or ECMT2110	Semester 2
3000-level units of study			
Interdisciplinary project unit			
DATA3001 to be developed for offering in 2019.			

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Methodology-focussed units			
DATA3404 **Data Science Platforms**	6	**A** This unit of study assumes that students have previous knowledge of database structures and of SQL. The prerequisite material is covered in DATA2001 or ISYS2120. Familiarity with a programming language (e.g. Java or C) is also expected. **P** DATA2001 OR ISYS2120 OR INFO2120 OR INFO2820 **N** INFO3504 OR INFO3404	Semester 1
ISYS3401 **Information Technology Evaluation**	6	**P** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160)	Semester 1
STAT3X23, STAT3X22, STAT3021, STAT3024 and DATA3406 are to be developed for offering in 2019.			
Application and discipline-focussed units			
ENVX3001 **Environmental GIS**	6	**P** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX	Semester 2
ENVX3002 **Statistics in the Natural Sciences**	6	**P** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 *Interdisciplinary Unit*	Semester 1
AMED3002 **Interrogating Biomedical and Health Data**	6	**A** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
QBUS3810 **Actuarial Risk Analytics**	6	**P** QBUS2810 or DATA2002 or ECMT2110 **N** ECMT3180	Semester 1

Data Science

DATA SCIENCE

Advanced coursework and projects will be available in 2020 for students who complete this major.

Data Science major

A major in Data Science requires 48 credit points from this table including:(i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level units according to the following rules*: (a) 6 credit points of selective units(b) 3 credit points of statistics units and 3 credit points of computations units(c) 3 credit points of advanced statistics units and 3 credit points of calculus and linear algebra units(iii) 12 credit points of 2000-level core units(iv) 6 credit points of 2000-level selective units (v) 6 credit points of 3000-level interdisciplinary project units(vi) 6 credit points of 3000-level methodology-focussed units(vii) 6 credit points of 3000-level methodology or application and discipline-focussed unitsAdditional application and discipline-focussed units will be available in 2019 in discipline areas including functional genomics, animal genetics/bioinformatics, geoscience /hydrology modelling.*Students not enrolled in the BSc may substitute ECMT1010 or BUSS1020

Data Science minor

A minor in Data Science requires 36 credit points from this table including:(i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level units according to the following rules*: (a) 6 credit points of selective units(b) 3 credit points of statistics units and 3 credit points of computations units(c) 3 credit points of advanced statistics units and 3 credit points of calculus and linear algebra units(iii) 12 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 6 credit points of 3000-level methodology-focussed units

Units of study

The units of study are listed below.

1000-level units of study

Core

DATA1002
Informatics: Data and Computation

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories, Project Work - own time **Prohibitions:** INFO1903 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers computation and data handling, integrating sophisticated use of existing productivity software, e.g. spreadsheets, with the development of custom software using the general-purpose Python language. It will focus on skills directly applicable to data-driven decision-making. Students will see examples from many domains, and be able to write code to automate the common processes of data science, such as data ingestion, format conversion, cleaning, summarization, creation and application of a predictive model.

Selective

DATA1001
Foundations of Data Science

Credit points: 6 **Teacher/Coordinator:** Dr Di Warren **Session:** Semester 1, Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prohibitions:** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021 **Assessment:** assignments, quizzes, presentation, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

DATA1001 is a foundational unit in the Data Science major. The unit focuses on developing critical and statistical thinking skills for all students. Does mobile phone usage increase the incidence of brain tumours? What is the public's attitude to shark baiting following a fatal attack? Statistics is the science of decision making, essential in every industry and undergirds all research which relies on data. Students will use problems and data from the physical, health, life and social sciences to develop adaptive problem solving skills in a team setting. Taught interactively with embedded technology, DATA1001 develops critical thinking and skills to problem-solve with data. It is the prerequisite for DATA2002.

Textbooks
Statistics, Fourth Edition, Freedman Pisani Purves

ENVX1002
Introduction to Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Thomas Bishop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour tutorial per week, one 2-hour computer practical per week **Prohibitions:** ENVX1001 **Assessment:** One exam during the exam period (50%), three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This is an introductory statistics unit for students in the agricultural, life and environmental sciences. It provides the foundation for statistics and data science skills that are needed for a career in science and for further study in applied statistics and data science. In the first portion of the unit the emphasis is on describing data using statistical and graphical summaries, and probability models. In the second part the focus is on formal hypothesis testing on experimental data using statistical tests. The final part of the unit is on finding patterns in biological and environmental data, through the use of linear and non-linear functions. In the practicals the emphasis is on applying theory to analysing real datasets using the spreadsheet package Excel and the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks
No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

Statistics units

MATH1005
Statistical Thinking with Data

Credit points: 3 **Session:** Semester 2, Summer Main, Winter Main **Classes:** Lectures 2 hrs/week; Practical 1 hr/week **Prohibitions:** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:**

One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In a data-rich world, global citizens need to problem solve with data, and evidence based decision-making is essential is every field of research and work.

This unit equips you with the foundational statistical thinking to become a critical consumer of data. You will learn to think analytically about data and to evaluate the validity and accuracy of any conclusions drawn. Focusing on statistical literacy, the unit covers foundational statistical concepts, including the design of experiments, exploratory data analysis, sampling and tests of significance.

Textbooks

Freedman, Pisani and Purves, Statistics, Norton, 2007

MATH1015
Biostatistics

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1015 is designed to provide a thorough preparation in statistics for students in the Biological and Medical Sciences. It offers a comprehensive introduction to data analysis, probability and sampling, inference including t-tests, confidence intervals and chi-squared goodness of fit tests.

Textbooks

As set out in the Junior Mathematics Handbook

Computation units

MATH1115
Interrogating Data

Credit points: 3 **Session:** Semester 1, Semester 2, Winter Main **Classes:** 2-hr lab; and 1x1-hr lecture per week **Prerequisites:** MATH1005 or MATH1015 **Prohibitions:** DATA1001 or STAT1021 or ECMT1010 or ENVX1001 or BUSS1020 or ENVX1002 or MATH1905 **Assessment:** projects/presentations, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

In a data-rich world, global citizens need to problem solve with data, and evidence based decision-making is essential is every field of research and work. This unit equips you with foundational statistical thinking to interrogate data. Focusing on statistical literacy, the unit covers foundational statistical concepts such as visualising data, the linear regression model, and testing significance using the t and chi-square tests. Based on a flipped learning approach, you will experience most of your learning in weekly collaborative 2 hour labs, supplemented by 1 hour lectures. Working in teams, you will explore three real data stories across different domains, with associated literature. The combination of MATH1005/1015 and MATH1115 is equivalent to DATA1001, allowing you to pathway to the Data Science, Statistics, or Quantitative Life Sciences majors.

Textbooks

Freedman, Pisani and Purves, Statistics, 2007

Advanced Statistics units

MATH1905
Statistical Thinking with Data (Advanced)

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. This Advanced level unit of study parallels the normal unit MATH1005 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

Maths units

MATH1021
Calculus Of One Variable

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals.

Textbooks

As set out in the Junior Mathematics Handbook.

MATH1921
Calculus Of One Variable (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals. Additional theoretical topics included in this advanced unit include the Intermediate Value Theorem, Rolle's Theorem, and the Mean Value Theorem.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1931
Calculus Of One Variable (SSP)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1921 Calculus of One Variable (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

MATH1023
Multivariable Calculus and Modelling

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1923
Multivariable Calculus and Modelling (Adv)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable. Additional topics covered in this advanced unit of study include the use of diagonalisation of matrices to study systems of linear equation and optimisation problems, limits of functions of two or more variables, and the derivative of a function of two or more variables.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1933
Multivariable Calculus and Modelling (SSP)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1923 Multivariable Calculus and Modelling (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

MATH1002
Linear Algebra

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1014 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1002 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study introduces vectors and vector algebra, linear algebra including solutions of linear systems, matrices, determinants, eigenvalues and eigenvectors.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1902
Linear Algebra (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1002 or MATH1012 or MATH1014 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. It parallels the normal unit MATH1002 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks
As set out in the Junior Mathematics Handbook

*Students not enrolled in BSc – Substitute units

2000-level units of study

Core

DATA2001
Data Science: Big Data and Data Diversity

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** DATA1002 OR INFO1110 OR INFO1903 OR INFO1103 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course focuses on methods and techniques to efficiently explore and analyse large data collections. Where are hot spots of pedestrian accidents across a city? What are the most popular travel locations according to user postings on a travel website? The ability to combine and analyse data from various sources and from databases is essential for informed decision making in both research and industry.

Students will learn how to ingest, combine and summarise data from a variety of data models which are typically encountered in data science projects, such as relational, semi-structured, time series, geospatial, image, text. As well as reinforcing their programming skills through experience with relevant Python libraries, this course will also introduce students to the concept of declarative data processing with SQL, and to analyse data in relational databases. Students will be given data sets from, eg. , social media, transport, health and social sciences, and be taught basic explorative data analysis and mining techniques in the context of small use cases. The course will further give students an understanding of the challenges involved with analysing large data volumes, such as the idea to partition and distribute data and computation among multiple computers for processing of 'Big Data'.

DATA2002
Data Analytics: Learning from Data

Credit points: 6 **Teacher/Coordinator:** Jean Yang **Session:** Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prerequisites:** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **Prohibitions:** STAT2012 or STAT2912 **Assumed knowledge:** (Basic Linear Algebra and some coding) or QBUS1040 **Assessment:** written assignment, presentation, exams **Mode of delivery:** Normal (lecture/lab/tutorial) day

Technological advances in science, business, engineering has given rise to a proliferation of data from all aspects of our life. Understanding the information presented in these data is critical as it enables informed decision making into many areas including market intelligence and science. DATA2002 is an intermediate course in statistics and data sciences, focusing on learning data analytic skills for a wide range of problems and data. How should the Australian government measure and report employment and unemployment? Can we tell the difference between decaffeinated and regular coffee ? In this course, you will learn how to ingest, combine and summarise data from a variety of data models which are typically encountered in data science projects as well as reinforcing their programming skills through experience with statistical programming language. You will also be exposed to the concept of statistical machine learning and develop the skill to analyze various types of data in order to answer a scientific question. From this unit, you will develop knowledge and skills that will enable you to embrace data analytic challenges stemming from everyday problems.

Selective

COMP2123
Data Structures and Algorithms

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **Prohibitions:** INFO1105 OR INFO1905 OR COMP2823 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will teach some powerful ideas that are central to solving algorithmic problems in ways that are more efficient than naive approaches. In particular, students will learn how data collections can support efficient access, for example, how a dictionary or map can allow key-based lookup that does not slow down linearly as the collection grows in size. The data structures covered in this unit include lists, stacks, queues, priority queues, search trees, hash tables, and graphs. Students will also learn efficient techniques for classic tasks such as sorting a collection. The concept of asymptotic notation will be introduced, and used to describe the costs of various data access operations and algorithms.

COMP2823
Data Structures and Algorithms (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** Distinction level result in at least one of INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **Prohibitions:** INFO1105 OR INFO1905 OR COMP2123 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will teach some powerful ideas that are central to solving algorithmic problems in ways that are more efficient than naive approaches. In particular, students will learn how data collections can support efficient access, for example, how a dictionary or map can allow key-based lookup that does not slow down linearly as the collection grows in size. The data structures covered in this unit include lists, stacks, queues, priority queues, search trees, hash tables, and graphs. Students will also learn efficient techniques for classic tasks such as sorting a collection. The concept of asymptotic notation will be introduced, and used to describe the costs of various data access operations and algorithms.

ISYS2120
Data and Information Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials, Laboratories, Project Work - own time **Prerequisites:** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 OR INFO1003 OR INFO1903 OR DECO1012 **Prohibitions:** INFO2120 OR INFO2820 OR COMP5138 **Assumed knowledge:** Programming skills **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The ubiquitous use of information technology leaves us facing a tsunami of data produced by users, IT systems and mobile devices. The proper management of data is hence essential for all applications and for effective decision making within organizations.

This unit of study will introduce the basic concepts of database designs at the conceptual, logical and physical levels. We will place particular emphasis on introducing integrity constraints and the concept of data normalization which prevents data from being corrupted or duplicated in different parts of the database. This in turn helps in the data remaining consistent during its lifetime. Once a database design is in place, the emphasis shifts towards querying the data in order to extract useful information. The unit will introduce the SQL database query languages, which is industry standard. Other topics covered will include the important concept of transaction management, application development with a backend database, and an overview of data warehousing and OLAP.

STAT2011
Probability and Estimation Theory

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory week. **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **Prohibitions:** STAT2901 or STAT2001 or STAT2911 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to univariate techniques in data analysis and the most common statistical distributions that are used to model patterns of variability. Common discrete random models like the binomial, Poisson and geometric, continuous models including the normal and exponential will be studied along with elementary regression models. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2911
Probability and Statistical Models (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **Prohibitions:** STAT2001 or STAT2901 or STAT2011 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an advanced version of STAT2011, with an emphasis on the mathematical techniques used to manipulate random variables and probability models. Common distributions including the Poisson, normal, beta and gamma families as well as the bivariate normal are introduced. Moment generating functions and convolution methods are used to understand the behaviour of sums of random variables. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The notions of conditional expectation and prediction will be covered as will be distributions related to the normal: chi^2, t and F. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

QBUS2830
Actuarial Data Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** 1x 2hr lecture per wk and 1x 1hr tutorial per wk **Prerequisites:** QBUS2810 or DATA2002 or ECMT2110 **Assumed knowledge:** BUSS1020 or ECMT1010 or ENVX1001 or ENVX1002 or ((MATH1005 or MATH1015) and MATH1115) or 6 credit points in MATH 1000-level units including MATH1905. **Assessment:** assignments (30%), mid-semester exam (20%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit covers a range of statistical models and methods for analysing quantitative actuarial data in general insurance. Both maximum likelihood estimation and Bayesian estimation methods are adopted for statistical inferences with the use of modern software tools such as the R and OpenBUGS packages. Topics covered include probability distributions for actuarial modelling, claim size modelling, claim frequency modelling, loss reserve forecasting, pure premium calculation, premium rates reviewing and revising (credibility theory), linear and generalised linear models, Poisson process and Markov process in actuarial modelling. Upon the completion of this unit and other relevant business analytics units, students may undertake professional examinations for actuaries or may get exemptions in some professional examination papers.

3000-level units of study

Interdisciplinary project unit

DATA3001 to be developed for offering in 2019.

Methodology-focussed units

DATA3404
Data Science Platforms

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** DATA2001 OR ISYS2120 OR INFO2120 OR INFO2820 **Prohibitions:** INFO3504 OR INFO3404 **Assumed knowledge:** This unit of study assumes that students have previous knowledge of database structures and of SQL. The prerequisite material is covered in DATA2001 or ISYS2120. Familiarity with a programming language (e.g. Java or C) is also expected. **Assessment:** through semester assessment (40%), final exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a comprehensive overview of the internal mechanisms data science platforms and of systems that manage large data collections. These skills are needed for successful performance tuning and to understand the scalability challenges faced by when processing Big Data. This unit builds upon the second' year DATA2001 - 'Data Science - Big Data and Data Diversity' and correspondingly assumes a sound understanding of SQL and data analysis tasks.

The first part of this subject focuses on mechanisms for large-scale data management. It provides a deep understanding of the internal components of a data management platform. Topics include: physical data organization and disk-based index structures, query processing and optimisation, and database tuning.

The second part focuses on the large-scale management of big data in a distributed architecture. Topics include: distributed and replicated databases, information retrieval, data stream processing, and web-scale data processing.

The unit will be of interest to students seeking an introduction to data management tuning, disk-based data structures and algorithms, and information retrieval. It will be valuable to those pursuing such careers as Software Engineers, Data Engineers, Database Administrators, and Big Data Platform specialists.

ISYS3401
Information Technology Evaluation

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160) **Assessment:** Through semester assessment (35%) and Final Exam (65%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Information Systems (IS) professionals in today's organisations are required to play leadership roles in change and development. Your success in this field will be aided by your being able to carry out research-based investigations using suitable methods and mastery over data collection and analysis to assist in managing projects and in decision making. Practical research skills are some of the most important assets you will need in your career.

This unit of study will cover important concepts and skills in practical research for solving and managing important problems. This will also provide you with the skills to undertake the capstone project in the IS project unit of study offered in Semester 2 or other projects. It will also provide hand-on experience of using Microsoft Excel and other tools to perform some of the quantitative analysis.

STAT3X23, STAT3X22, STAT3021, STAT3024 and DATA3406 are to be developed for offering in 2019.

Application and discipline-focussed units

ENVX3001
Environmental GIS

Credit points: 6 **Teacher/Coordinator:** A/Prof Inakwu Odeh **Session:** Semester 2 **Classes:** Three-day field trip, (two lectures and two practicals per week) **Prerequisites:** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX **Assessment:** One 15-minute presentation (10%), 3500wd prac report (35%), 1500wd report on trip excursion (15%), 2-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to impart knowledge and skills in spatial analysis and geographical information science (GISc) for decision-making in an environmental context. The lecture material will present several themes: principles of GISc, geospatial data sources and acquisition methods, processing of geospatial data and spatial statistics. Practical exercises will focus on learning geographical information systems (GIS) and how to apply them to land resource assessment, including digital terrain modelling, land-cover assessment, sub-catchment modelling, ecological applications, and soil quality assessment for decisions regarding sustainable land use and management. A three day field excursion during the mid-semester break will involve a day of GPS fieldwork at Arthursleigh University farm and two days in Canberra visiting various government agencies which research and maintain GIS coverages for Australia. By the end of this UoS, students should be able to: differentiate between spatial data and spatial information; source geospatial data from government and private agencies; apply conceptual models of spatial phenomena for practical decision-making in an environmental context; apply critical analysis of situations to apply the concepts of spatial analysis to solving environmental and land resource problems; communicate effectively results of GIS investigations through various means- oral, written and essay formats; and use a major GIS software package such as ArcGIS.

Textbooks

Burrough, P.A. and McDonnell, R.A. 1998. Principles of Geographic Information Systems. Oxford University Press: Oxford.

Clarke, K. C. 2003. Getting Started With Geographic Information Systems. 4th Edition. Prentice Hall: Upper Saddle River, New Jersey.

ENVX3002
Statistics in the Natural Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** one 2-hour workshop per week, one 3-hour computer practical per week **Prerequisites:** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 **Assessment:** One exam during the exam period (50%), five assessment tasks (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Interdisciplinary Unit

This unit of study is designed to introduce students to the analysis of data they may face in their future careers, in particular data that are not well behaved. The data may be non-normal, there may be missing observations, they may be correlated in space and time or too numerous to analyse with standard models. The unit is presented in an applied context with an emphasis on correctly analysing authentic datasets, and interpreting the ouput. It begins with the analysis and design experiments based on the general linear model. In the second part, students will learn about the generalisation of the general linear model to accommodate non-normal data with a particular emphasis on the binomial and poisson distributions. In the third part linear mixed models will be introduced which provide the means to analyse datasets that do not meet the assumptions of independent and equal errors, for example data that is correlated in space and time. The units ends with an introduction to machine learning and predictive modelling. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

AMED3002
Interrogating Biomedical and Health Data

Credit points: 6 **Teacher/Coordinator:** Prof Jean Yang **Session:** Semester 1 **Classes:** face to face 5 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assumed knowledge:** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. **Assessment:** in-semester exam, assignments, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Biotechnological advances have given rise to an explosion of original and shared public data relevant to human health. These data, including the monitoring of expression levels for thousands of genes and proteins simultaneously, together with multiple databases on biological systems, now promise exciting, ground-breaking discoveries in complex diseases. Critical to these discoveries will be our ability to unravel and extract information from these data. In this unit, you will develop analytical skills required to work with data obtained in the medical and diagnostic sciences. You will explore clinical data using powerful, state of the art methods and tools. Using real data sets, you will be guided in the application of modern data science techniques to interrogate, analyse and represent the data, both graphically and numerically. By analysing your own real data, as well as that from large public resources you will learn and apply the methods needed to find information on the relationship between genes and disease. Leveraging expertise from multiple sources by working in team-based collaborative learning environments, you will develop knowledge and skills that will enable you to play an active role in finding meaningful solutions to difficult problems, creating an important impact on our lives.

QBUS3810
Actuarial Risk Analytics

Credit points: 6 **Session:** Semester 1 **Classes:** 1x 2hr lecture and 1x 1hr tutorial per week **Prerequisites:** QBUS2810 or DATA2002 or ECMT2110 **Prohibitions:** ECMT3180 **Assessment:** assignment 1 (10%), assignment 2 (10%), assignment 3 (10%), mid-semester exam (15%), group assignment (15%), final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Everyone working in business needs to understand and manage risk. This unit provides the basic knowledge and tools needed to do this. It includes material on the risk management strategies that every business needs, as well as specific quantitative and statistical techniques for evaluating risk. Through this unit students learn how different aspects of risk management fit together (like Value-at-Risk (VaR) and tail-VaR calculations, Monte-Carlo simulation, extreme value theory, individual and collective risk models, credibility theory and credit scoring).

Ecology and Evolutionary Biology

Study in Ecology and Evolutionary Biology is offered by the School of Life and Environmental Science. Units of study in this major are mostly available at standard and advanced level.

About the major

Ecology and evolution are important concepts that underlie a broad range of the biological sciences. Ecology investigates the processes that govern the biological interactions between individuals and that operate on ecosystem scales. Evolution is a unifying theme that explains the patterns we observe in the natural world, ranging from genomes to the diversification of life through time.

The fields of Ecology and Evolution intersect at multiple levels and are critically relevant to real-world challenges, including wildlife conservation.

In this major you will learn about evolutionary and ecological processes and how these influence the population dynamics of animals, plants, and other organisms. This knowledge forms the basis for the effective management and conservation of biodiversity, ecosystems, and habitats.

Requirements for completion

A major in Ecology and Evolutionary Biology requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)18 credit points of 3000-level core units
(iv)6 credit points of 3000-level selective units

A minor in Wildlife Conservation is available and articulates to this major.

First year

The core units in first year Biology, Life and Evolution (BIOL1XX6) and From Molecules to Ecosystems (BIOL1XX7), provide students with an understanding of the concepts that are central to Ecology and Evolutionary Biology. These units will provide a broader context within which these concepts can be interpreted, including the scientific framework, hypothesis testing, and experimental design. First year Biology units also provide sufficient background in (bio)chemistry for this major.

Second year

In the second year, Biology Experimental Design and Analysis (BIOL2X22) provides students with sufficient background to design complex ecological and evolutionary experiments in the field, including multifactorial experiments, and to analyse and interpret their data. Ecology and Conservation (BIOL2X24) builds on the broad introduction to Ecology and Evolutionary Biology in the first year.

Third year

In the third year there will be dedicated units on Ecology (BIOL3X07), Evolutionary Biology (BIOL3X33), and Australian Biodiversity and Systematics (BIOL3X34). Selective units include the field units Marine Field Ecology (BIOL3008) and Terrestrial Field Ecology (BIOL3009). For those students who need an on-campus experience, units include Animal Ecological Physiology (BIOL3X45) and Animal Behaviour (BIOL3X46). Throughout, there will be emphasis on experimental design and analysis, building on the material taught in the second year. In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours

Requirements for Honours in the area of Ecology and Evolutionary Biology: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/about-us/index.shtml
T 1800 793 864

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building (F07)
The University of Sydney NSW 2006

Professor Frank Seebacher
T +61 2 9351 2779
E frank.seebacher@sydney.edu.au

Professor Simon Ho
T +61 2 9351 8681
E simon.ho@sydney.edu.au

Learning Outcomes

Students who graduate from Ecology and Evolutionary Biology will be able to:

1. Use biological language to discuss, explain and apply ecological and evolutionary processes and their role in wildlife conservation.
2. Independently identify and interpret ecological and evolutionary literature.
3. Use statistical tools and concepts to analyse and interpret ecological and evolutionary data.
4. Describe and explain the meaning of ecological and evolutionary experimental results within the context of the current literature.
5. Communicate the objectives and hypotheses being tested in experimental investigations.
6. Create coherent arguments in oral presentations and written reports using evidence from experiments and the literature.
7. Analyse the effectiveness of species conservation strategies and conflicts from multiple perspectives.
8. Analyse conservation issues using ecological and evolutionary principles from individual species to global populations and communities.

Ecology and Evolutionary Biology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ECOLOGY AND EVOLUTIONARY BIOLOGY*			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Ecology and Evolutionary Biology major			
A major in Ecology and Evolutionary Biology requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units *The Wildlife Conservation minor articulates to the Ecology and Evolutionary Biology major			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
BIOL2022 **Biology Experimental Design and Analysis**	6	**A** BIOL1XXX or MBLG1XXX **P** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **N** BIOL2922 or BIOL3006 or BIOL3906	Semester 2
BIOL2922 **Biol Experimental Design and Analysis Adv**	6	**A** BIOL1XXX or MBLG1XXX **P** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **N** BIOL2022 or BIOL3006 or BIOL3906	Semester 2
BIOL2024 **Ecology and Conservation**	6	**A** BIOL1XXX or MBLG1XXX **N** BIOL2924	Semester 2
BIOL2924 **Ecology and Conservation (Advanced)**	6	**A** BIOL1XXX or MBLG1XXX **P** An annual average mark of at least 70 in the previous year **N** BIOL2024	Semester 2
3000-level units of study			
Core			
BIOL3007 **Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3907	Semester 2
BIOL3907 **Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3007	Semester 2
BIOL3033 and BIOL3034 are to be developed for offering in 2019.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Selective			
BIOL3008 **Marine Field Ecology** *This unit of study is not available in 2018*	6	**P** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **N** BIOL3908 or BIOL2028 or BIOL2928 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive July
BIOL3908 **Marine Field Ecology (Advanced)** *This unit of study is not available in 2018*	6	**P** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **N** BIOL3008 or BIOL2028 or BIOL2928 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive July
BIOL3009 **Terrestrial Field Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3909 or BIOL2009 or BIOL2909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
BIOL3909 **Terrestrial Field Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3009 or BIOL2009 or BIOL2909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered. This unit is not offered from 2019.*	Intensive July
BIOL3045 **Animal Ecological Physiology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3945 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912	Semester 1
BIOL3046 **Animal Behaviour**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3946 or BIOL3025 or BIOL3925	Semester 1
BIOL3946 **Animal Behaviour (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3046 or BIOL3025 or BIOL3925 *Note: Department permission required for enrolment*	Semester 1
BIOL3020 and AVBS3004 to be developed for offering in 2019.			

Wildlife Conservation Minor*

A minor in Wildlife Conservation requires 36 credit points from this table including:

(i) 12 credit points of 1000-level core units

(ii) 12 credit points of 2000-level core units

(iii) 6 credit points of 3000 level core units

(iv) 6 credit points of 3000-level selective units

*The Wildlife Conservation minor articulates to the Ecology and Evolutionary Biology major

Units of study

The units of study are listed below:

1000-level units of study

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Core			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
2000-level units of study			
Core			
BIOL2022 **Biology Experimental Design and Analysis**	6	**A** BIOL1XXX or MBLG1XXX **P** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **N** BIOL2922 or BIOL3006 or BIOL3906	Semester 2
BIOL2922 **Biol Experimental Design and Analysis Adv**	6	**A** BIOL1XXX or MBLG1XXX **P** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **N** BIOL2022 or BIOL3006 or BIOL3906	Semester 2
BIOL2024 **Ecology and Conservation**	6	**A** BIOL1XXX or MBLG1XXX **N** BIOL2924	Semester 2
BIOL2924 **Ecology and Conservation (Advanced)**	6	**A** BIOL1XXX or MBLG1XXX **P** An annual average mark of at least 70 in the previous year **N** BIOL2024	Semester 2
3000-level units of study			
Core			
AVBS3004 is to be developed for offereing in 2019.			
Selective			
BIOL3007 **Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3907	Semester 2
BIOL3907 **Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3007	Semester 2
BIOL3034 is to be developed for offering in 2019.			

Ecology and Evolutionary Biology

ECOLOGY AND EVOLUTIONARY BIOLOGY*

Advanced coursework and projects will be available in 2020 for students who complete this major.

Ecology and Evolutionary Biology major

A major in Ecology and Evolutionary Biology requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units *The Wildlife Conservation minor articulates to the Ecology and Evolutionary Biology major

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907

From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997

From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

2000-level units of study

Core

BIOL2022

Biology Experimental Design and Analysis

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **Prohibitions:** BIOL2922 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides foundational skills essential for doing research in biology and for critically judging the research of others. We consider how biology is practiced as a quantitative, experimental and theoretical science. We focus on the underlying principles and practical skills you need to explore questions and test hypotheses, particularly where background variation (error) is inherently high. In so doing, the unit provides you with an understanding of how biological research is designed, analysed and interpreted using statistics. Lectures focus on sound experimental and statistical principles, using examples in ecology and other fields of biology to demonstrate concepts. In the practical sessions, you will design and perform, analyse (using appropriate statistical tools) and interpret your own experiments to answer research questions in topics relevant to your particular interest. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and M. J. Keough. 2002. Experimental Design and Data Analysis for Biologists. 1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2922

Biol Experimental Design and Analysis Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **Prohibitions:** BIOL2022 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2922 will be based on BIOL2022 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and Keough, 2002. Experimental Design and Data Analysis for Biologists.1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2024
Ecology and Conservation

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prohibitions:** BIOL2924 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines the ecological principles driving the major ecosystems of the world and ecological processes behind the world's major conservation issues. It aims to develop in students the core foundations for an understanding of Ecology and its application in conservation. Lectures will focus on the ecology of the major terrestrial and marine biomes of the world. Application of ecological theory and methods to practical conservation problems will be integrated throughout the unit of study. Practical sessions will provide hands-on experience in ecological sampling and data handling to understand the ecology of marine and terrestrial environments, as well as ecological simulations to understand processes. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks
Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John
Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

BIOL2924
Ecology and Conservation (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An annual average mark of at least 70 in the previous year **Prohibitions:** BIOL2024 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2924 will be based on BIOL2024 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John
Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

3000-level units of study

Core

BIOL3007
Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3907 **Assessment:** One 2-hour exam, group presentations, one essay, one project report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the dynamics of ecological systems, and considers the interactions between individual organisms and populations, organisms and the environment, and ecological processes. Lectures are grouped around four dominant themes: Interactions, Evolutionary Ecology, The Nature of Communities, and Conservation and Management. Emphasis is placed throughout on the importance of quantitative methods in ecology, including sound planning and experimental designs, and on the role of ecological science in the conservation, management, exploitation and control of populations. Relevant case studies and examples of ecological processes are drawn from marine, freshwater and terrestrial systems, with plants, animals, fungi and other life forms considered as required. Students will have some opportunity to undertake short term ecological projects, and to take part in discussions of important and emerging ideas in the ecological literature.

Textbooks
Begon M, Townsend CR, Harper JL (2005) Ecology, From individuals to ecosystems. Wiley-Blackwell.

BIOL3907
Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two lectures per week, weekly tutorial and 3-hour practical per week **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3007 **Assessment:** One 2-hour exam, presentations, one essay, one project report (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as BIOL3007 Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study participate in alternatives to some elements of the standard course and will be encouraged to pursue the objectives by more independent means in a series of research tutorials. Specific details of this unit of study and assessment will be announced in meetings with students in week 1 of semester 2. This unit of study may be taken as part of the BSc (Advanced) program.

Textbooks
As for BIOL3007

BIOL3033 and BIOL3034 are to be developed for offering in 2019.

Selective

BIOL3008
Marine Field Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Ross Coleman **Session:** Intensive July **Classes:** Intensive 8-day field course held in the pre-semester break. **Prerequisites:** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3908 or BIOL2028 or BIOL2928 **Assessment:** Discussion groups, research project proposal, biodiversity survey report, data analysis and checking, research project report (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This field course provides a practical introduction to the experimental analysis of marine populations and assemblages. Students gain experience using a range of intertidal sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. No particular mathematical or statistical skills are required for this subject. Group experimental research projects in the field are the focus of the unit during the day, with lectures and discussion groups about the analysis of experimental data and current issues in experimental marine ecology occurring in the evening.

Textbooks
No textbook is prescribed but Coastal Marine Ecology of Temperate Australia. Eds. Underwood, A.J. & Chapman, M.G. 1995. University of New South Wales Press, provides useful background reading.

BIOL3908
Marine Field Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Ross Coleman. **Session:** Intensive July **Classes:** One 8-day field course held in the pre-semester break, plus four 1-hour tutorials during semester 2. **Prerequisites:** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3008 or BIOL2028 or BIOL2928 **Assessment:** Discussion groups, research project proposal, biodiversity report, data analysis and checking, research project report (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This unit has the same objectives as Marine Field Ecology BIOL3008, and is suitable for students wishing to pursue certain aspects of marine field ecology in a greater depth. Entry is restricted and selection is made from applicants on the basis of past performance. Students taking this unit of study will be expected to take part in a number of additional tutorials after the field course on advanced aspects of experimental design and analysis and will be expected to incorporate these advanced skills into their analyses and project reports. This unit may be taken as part of the BSc(Advanced).

Textbooks

As for BIOL 3008.

BIOL3009
Terrestrial Field Ecology

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** Note: One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3909 or BIOL2009 or BIOL2909 **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), specimen collection (10%), research project report (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

This intensive field-based course provides practical experience in terrestrial ecology suited to a broad range of careers in ecology, environmental consulting and wildlife management. Students learn a broad range of ecological sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. The field work takes place in native forest and incorporates survey techniques for plants, small mammals and invertebrates and thus provides a good background for ecological consulting work and an introduction into large-scale project management. Students attend a week-long field course and participate in a large-scale research project as well as conducting their own research project. Emphasis is placed on critical thinking in the context of environmental management and technical skills are developed in the area of data handling and analysis, report writing and team work. Invited experts contribute to the lectures and discussions on issues relating to the ecology, conservation and management of Australia's terrestrial flora and fauna.

BIOL3909
Terrestrial Field Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3009 or BIOL2009 or BIOL2909 **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), sample and data processing (10%), research project report (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered. This unit is not offered from 2019.

This unit has the same objectives as BIOL3009 Terrestrial Field Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from applicants on the basis of previous performance. Students taking this unit of study will complete an individual research project on a topic negotiated with a member of staff. It is expected that much of the data collection will be completed during the field trip but some extra time may be needed during semester 2. Specific details of this unit of study and assessment will be announced in meetings with students at the beginning of the unit. This unit of study may be taken as part of the BSc (Advanced) program.

BIOL3045
Animal Ecological Physiology

Credit points: 6 **Teacher/Coordinator:** Prof Frank Seebacher **Session:** Semester 1 **Classes:** Two lectures and three practicals per week **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3945 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912 **Assessment:** Two practical reports (20% and 40% of total marks, respectively), one 1.5-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Ecological Physiology is a conceptually based unit of study that covers physiological interactions between organisms and their environments. The unit explores evolutionary processes that allow animals to persist in variable environments. These concepts are essential to understanding biodiversity and ecological function of animal populations, and how these are likely to change under future climate change. The unit will be suitable for those with an interest in zoology, as well as students with a particular interest in ecology and evolution. There is a strong focus on experimental biology and incorporating theory into practical classes, during which students design their own experiments. Good working knowledge of statistical analyses is assumed. The unit provides essential skills for conducting and presenting research, and for critical evaluation of published research.

BIOL3046
Animal Behaviour

Credit points: 6 **Teacher/Coordinator:** Prof Ashley Ward **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3946 or BIOL3025 or BIOL3925 **Assessment:** Practical reports, one 2-hour exam (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit will provide a broad overview of the scientific study of animal behaviour. It will consider mechanistic and functional explanations of animal behaviour across contexts including kin selection and altruism, sociality, foraging, aggression and competition, sexual selection and mate choice, the behaviour of predators and prey, and communication and signalling. The information presented and discussed in this unit will reflect the most up-to-date research in each aspect of the field of animal behaviour. Practical sessions are closely aligned with the lecture material and will foster the development of key skills by providing hands-on experience of experimental design, data collection and analysis.

Textbooks

Davies, Krebs, West: An Introduction to Behavioural Ecology, 4th edition, Wiley-Blackwell.

BIOL3946
Animal Behaviour (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Ashley Ward **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3046 or BIOL3025 or BIOL3925 **Assessment:** Practical reports, one 2-hour exam (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The content will be based on the standard unit BIOL3046 but qualified students will participate in alternative components at a more advanced level. The unit will provide a broad overview of the scientific study of animal behaviour. It will consider mechanistic and functional explanations of animal behaviour across contexts including kin selection and altruism, sociality, foraging, aggression and competition, sexual selection and mate choice, the behaviour of predators and prey, and communication and signalling. The information presented and discussed in this unit will reflect the most up-to-date research in each aspect of the field of animal behaviour. Practical sessions are closely aligned with the lecture material and will foster the development of key skills by providing hands-on experience of experimental design, data collection and analysis.

Textbooks

Davies, Krebs, West: An Introduction to Behavioural Ecology, 4th edition, Wiley-Blackwell.

BIOL3020 and AVBS3004 to be developed for offering in 2019.

Wildlife Conservation Minor*

A minor in Wildlife Conservation requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) 6 credit points of 3000 level core units(iv) 6 credit points of 3000-level selective units*The Wildlife Conservation minor articulates to the Ecology and Evolutionary Biology major

Units of study

The units of study are listed below:

1000-level units of study

Core

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

2000-level units of study

Core

BIOL2022
Biology Experimental Design and Analysis

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **Prohibitions:** BIOL2922 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides foundational skills essential for doing research in biology and for critically judging the research of others. We consider how biology is practiced as a quantitative, experimental and theoretical science. We focus on the underlying principles and practical skills you need to explore questions and test hypotheses, particularly where background variation (error) is inherently high. In so doing, the unit provides you with an understanding of how biological research is designed, analysed and interpreted using statistics. Lectures focus on sound experimental and statistical principles, using examples in ecology and other fields of biology to demonstrate concepts. In the practical sessions, you will design and perform, analyse (using appropriate statistical tools) and interpret your own experiments to answer research questions in topics relevant to your particular interest. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks
Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and M. J. Keough. 2002. Experimental Design and Data Analysis for Biologists. 1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2922
Biol Experimental Design and Analysis Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **Prohibitions:** BIOL2022 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2922 will be based on BIOL2022 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and Keough, 2002. Experimental Design and Data Analysis for Biologists.1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2024
Ecology and Conservation

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prohibitions:** BIOL2924 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines the ecological principles driving the major ecosystems of the world and ecological processes behind the world's major conservation issues. It aims to develop in students the core foundations for an understanding of Ecology and its application in conservation. Lectures will focus on the ecology of the major terrestrial and marine biomes of the world. Application of ecological theory and methods to practical conservation problems will be integrated throughout the unit of study. Practical sessions will provide hands-on experience in ecological sampling and data handling to understand the ecology of marine and terrestrial environments, as well as ecological simulations to understand processes. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John
Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

BIOL2924
Ecology and Conservation (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An annual average mark of at least 70 in the previous year **Prohibitions:** BIOL2024 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2924 will be based on BIOL2024 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John
Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

3000-level units of study

Core

AVBS3004 is to be developed for offereing in 2019.

Selective

BIOL3007
Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3907 **Assessment:** One 2-hour exam, group presentations, one essay, one project report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the dynamics of ecological systems, and considers the interactions between individual organisms and populations, organisms and the environment, and ecological processes. Lectures are grouped around four dominant themes: Interactions, Evolutionary Ecology, The Nature of Communities, and Conservation and Management. Emphasis is placed throughout on the importance of quantitative methods in ecology, including sound planning and experimental designs, and on the role of ecological science in the conservation, management, exploitation and control of populations. Relevant case studies and examples of ecological processes are drawn from marine, freshwater and terrestrial systems, with plants, animals, fungi and other life forms considered as required. Students will have some opportunity to undertake short term ecological projects, and to take part in discussions of important and emerging ideas in the ecological literature.

Textbooks

Begon M, Townsend CR, Harper JL (2005) Ecology, From individuals to ecosystems. Wiley-Blackwell.

BIOL3907
Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two lectures per week, weekly tutorial and 3-hour practical per week **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3007 **Assessment:** One 2-hour exam, presentations, one essay, one project report (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as BIOL3007 Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study participate in alternatives to some elements of the standard course and will be encouraged to pursue the objectives by more independent means in a series of research tutorials. Specific details of this unit of study and assessment will be announced in meetings with students in week 1 of semester 2. This unit of study may be taken as part of the BSc (Advanced) program.

Textbooks

As for BIOL3007

BIOL3034 is to be developed for offering in 2019.

Environmental Science

Study in the discipline of Environmental Science is jointly offered by the School of Geosciences and School of Life and Environmental Science. Units of study in this major are mostly available at standard and advanced level.

About the program

In the 21st century the demand on the earth's resources is placing the world's future on a non-sustainable course, where there is ongoing degradation of natural resources and diminishing biodiversity, and planetary cycles related to climate are reaching points of irreversible change. James Martin states that it is the 'young people who collectively, will be responsible for the greatest transition in human history. We must teach young people to understand this century and play its complex game'.

The environmental science program will provide students with the understanding and skills they need to find solutions to environmental problems. Students in the environmental science program will develop the knowledge and skills to find solutions to complex environmental problems. In this program students will develop the technical laboratory and field skills to measure, monitor and analyse environmental problems and to integrate this information with spatial data to propose management solutions.

Students will develop a strong multi-disciplinary scientific understanding of regional, national and global environmental issues. Taken in combination with a major in Environmental Studies or another disciplinary major (i.e. Chemistry, Biology, Biochemistry and Molecular Biology and Microbiology) students will contribute to solving contemporary global issues and sustaining life on earth in this "make or break" century. Students will also have pathways to teach Earth and Environmental Studies and continue to Masters level in Sustainability and Science.

Requirements for completion

A program in Environmental Science requires 60 credit points, consisting of:

(i)12 credit points of 2000-level core units
(ii)A 48 credit point major in Environmental Science

A major in Environmental Science requires 48 credit points:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level selective units
(iii)12 credit points of 2000-level core units
(iv)18 credit points of 3000-level core units
(v)6 credit points of 3000-level selective units

First year

CHEM1XX1 and 6 credit points from a selection of GEOS1X01 and ENVI1003.

Second year

Core for major: BIOL2032, ENSC2001.
Core for program: GEOS2X16, SOIL2005.

The second year provides the breadth of knowledge in environmental science with units related to biodiversity, soil, landscapes and water. This is complemented in a unit related to the measurement and monitoring of environmental properties in the field and lab, and development of skills in the associated data analytics.

Third year

ENVI3XXX, GEOS3X19, ENVX3001 and 6 credit points from a selection of GEOS3102, LWSC3007, SOIL3011, AVBS3004.

The third year provides further breadth and depth with units in physical geography and climate. Data analytic skills are further developed with a unit related to the analysis of spatial data – crucial for all environmental management issues. Students will also have the opportunity to choose electives in a specialist area of interest from wildlife, energy, soil or water.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Environmental Science: completion of 24 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/geosciences/index.shtml
E allyson.montenegro@sydney.edu.au
T +61 2 9351 4796

Address:
School of Geosciences
Room 348, Madsen Building F09
The University of Sydney NSW 2006

Dr Daniel Penny
T +61 2 9351 6464
E dan.penny@sydney.edu.au

Assoc/Prof Damien Field
T +61 2 8627 1138
E damien.field@sydney.edu.au

Learning Outcomes

Students who graduate from Environmental Science will be able to:

Demonstrate broad and coherent knowledge of:

1. Natural and managed environments at various scales, interdependencies between human societies and these environments
2. Key sustainability challenges for natural and managed environments, and their drivers
3. Complexity, including holistic systems thinking

Demonstrate understanding of the core and applied sciences underpinning environmental systems, including:

1. Disciplinary and interdisciplinary approaches to identifying, measuring and analysing materials, patterns and processes relevant to contemporary environmental challenges
2. The core sciences in the context of natural and managed environments
3. Different sub-disciplines relevant to natural and managed environments, with a depth of understanding in one
4. The process of environmental decision making, which requires understanding of their own and others' values, knowledge, perspectives and interests
5. The relevant regulatory and policy contexts that enable environmental sciences.

Demonstrate cognitive, technical and communication skills by:

1. Collecting, accurately recording, analysing, interpreting and reporting data
2. Critically evaluating and synthesising data and information from a range of relevant sources and disciplines
3. Selecting and applying appropriate and/or theoretical techniques or tools in order to conduct an investigation
4. Working both independently and collaboratively
5. Communicating with diverse groups in various contexts using a range of written, oral and visual means

Demonstrate ethical professional, public and personal conduct by having capacity to:

1. Reflect on and direct their own learning and practice in the context of the environment
2. Participate constructively in decision-making consistent with regulatory frameworks and principles of sustainable development.

Environmental Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENVIRONMENTAL SCIENCE			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Environmental Science program			
A program in Environmental Science requires 60 credit points from this table including: (i) 12 credit points of 2000-level core units (ii) A 48 credit point major in Environmental Science			
Environmental Science major			
This major is only available to students enrolled in the Environmental Science program.			
A major in Environmental Science requires 48 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units (iv) 18 credit points of 3000-level core units (v) 6 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
Selective			
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
GEOS1901 **Earth, Environment and Society Advanced**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 *Note: Department permission required for enrolment*	Semester 1
ENVI1003 **Global Challenges: Food, Water, Climate**	6		Semester 2
2000-level units of study			
Program core			
GEOS2116 **Earth Surface Processes**	6	**N** GEOS2916 or GEOG2321	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
GEOS2916 **Earth Surface Processes (Advanced)**	6	**P** Annual average mark of at least 70 **N** GEOS2116 or GEOG2321	Semester 2
SOIL2005 **Soil and Water: Earth's Life Support Systems**	6	**N** SOIL2003 or LWSC2002	Semester 1
Major core			
BIOL2032 **Australian Wildlife Biology**	6	**N** ANSC2005	Semester 2
ENSC2001 **Environmental Monitoring**	6	**A** Understanding of scientific principles and concepts including biodiversity, human impacts on the environment, properties of substances (e.g., acidity, alkalinity, solvents) and basic knowledge of statistics. **N** AGCH3033	Semester 1
3000-level units of study			
Core			
ENVX3001 **Environmental GIS**	6	**P** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX	Semester 2
GEOS3X19 and ENVI3XXX are to be developed for offering in 2019.			
Selective			
GEOS3102 **Global Energy and Resources**	6	**P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3802 or GEOS3003 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 or GEOS3903	Semester 1
LWSC3007 **Advanced Hydrology and Modelling**	6	**P** LWSC2002	Semester 1
SOIL3011 and AVBS3004 are to be developed for offering in 2019.			

Environmental Science

ENVIRONMENTAL SCIENCE

Advanced coursework and projects will be available in 2020 for students who complete this major.

Environmental Science program

A program in Environmental Science requires 60 credit points from this table including: (i) 12 credit points of 2000-level core units (ii) A 48 credit point major in Environmental Science

Environmental Science major

This major is only available to students enrolled in the Environmental Science program.A major in Environmental Science requires 48 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units (iv) 18 credit points of 3000-level core units (v) 6 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic

orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Selective

GEOS1001
Earth, Environment and Society

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the gateway unit of study for Human Geography, Physical Geography, Environmental Studies and Geology. Its objective is to introduce the big questions relating to the origins and current state of the planet: climate change, environment, landscape formation, and the growth of the human population. During the semester you will be introduced to knowledge, theories and debates about how the world's physical and human systems operate. The first module investigates the evolution of the planet through geological time, with a focus on major Earth systems such as plate tectonics and mantle convection and their interaction with the atmosphere, hydrosphere, biosphere and human civilisations. The second module presents Earth as an evolving and dynamic planet, investigating global environmental change, addressing climate variability and human impacts on the natural environment and the rate at which these changes occur and how they have the potential to dramatically affect the way we live. Finally, the third module, focuses on human-induced challenges to Earth's future. This part of the unit critically analyses the relationships between people and their environments, with central consideration to debates on population change, resource use and the policy contexts of climate change mitigation and adaptation.

GEOS1901
Earth, Environment and Society Advanced

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1001, but will be required to carry out more challenging practical assignments.

ENVI1003
Global Challenges: Food, Water, Climate

Credit points: 6 **Teacher/Coordinator:** A/Prof Stephen Cattle **Session:** Semester 2 **Classes:** Two lectures per week, 2hour tutorial/computer lab per week, two-day weekend field trip **Assessment:** One 2-hour exam (50%), field trip report (15%), tutorial presentation (20%), GIS reports (15%) **Practical field work:** Computer practicals and two day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

In the 21st century the population of the world will increase both in size and its expectation in terms of food, energy and consumer demands. Against this demand we have a planet in crisis where natural resources are degraded, biodiversity is diminishing and planetary cycles related to climate are reaching points of irreversible change. Management of our precious natural resources is a balancing act between production and conservation as always, but now we have to do this against a background of potential large scale changes in climate. In this unit students will gain an understanding of the key environmental challenges of the 21st century; namely food security, climate change, water security, biodiversity protection, ecosystems services and soil security. In the second half using Australian case studies we will explore how we manage different agro-ecosystems within their physical constraints around water, climate and soil, while considering linkages with the global environmental challenges. Management now, in the past and the future will be considered, with an emphasis on food production. This unit is recommended unit for students interested in gaining a broad overview of the environmental challenges of the 21st century, both globally and within Australia.

2000-level units of study

Program core

GEOS2116
Earth Surface Processes

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x3-hr practical (lab/computer) sessions each week **Prohibitions:** GEOS2916 or GEOG2321 **Assessment:** practical and field assignments, final exam **Practical field work:** 3-5 day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

The surface of the planet on which you live is the product of a balance between tectonic forces and numerous agents of erosion. The landscapes in which you live and work, and from which you draw resources, are therefore the legacy of many processes operating synchronously over long time periods. It is also true that Earth's landscapes are dynamic, and constantly changing around you in response to climate, tectonics and patterns of life. The sustainable management of landscapes is strongly dependent upon an awareness of those processes and the ways that they constrain human-environment interactions. In Earth Surface Processes, you will learn how landscapes are produced, and what this means for contemporary land use. Lectures by experts in physical geography, geology, soil science and environmental science will introduce you to the planetary and regional-scale controls on landforms and landscape dynamics, and the nature and distribution of major Australian landscape types. Focussed around 'hands on' field and laboratory-based tasks, students will gain essential practical, analytical and interpretive skills in the analysis of landscapes and earth surface processes that shape them. This is a unit for anyone wanting to better understand the planet on which they live.

Textbooks

Allen, P.A., 2009. Earth surface processes. John Wiley and Sons. Scitech, 551.3 72 Sharma, V.K., 2010. Introduction to process geomorphology. CRC Press. Scitech, 551.41 113

GEOS2916
Earth Surface Processes (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x3-hr practical (lab/computer) sessions each week **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GEOS2116 or GEOG2321 **Assessment:** practical and research assignments, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The surface of the planet on which you live is the product of a balance between tectonic forces and numerous agents of erosion. The landscapes in which you live and work, and from which you draw resources, are therefore the legacy of many processes operating synchronously over long time periods. It is also true that Earth's landscapes are dynamic, and constantly changing around you in response to climate, tectonics and patterns of life. The sustainable management of landscapes is strongly dependent upon an awareness of those processes and the ways that they constrain human-environment interactions. In the Advanced mode of Earth Surface Processes, you will learn how landscapes are produced, and what this means for contemporary land use. Lectures by experts in physical geography, geology, soil science and environmental science will introduce you to the planetary and regional-scale controls on landforms and landscape dynamics, and the nature and distribution of major Australian landscape types. Focussed around 'hands on' field and laboratory-based tasks, students will gain essential practical, analytical and interpretive skills in the analysis of landscapes and earth surface processes that shape them. The Advanced mode of Earth Surface Processes challenges you to create new knowledge, and provides a higher level of academic rigour. You will take part in a series of small-group practical exercises that will develop your skills in research design and execution, and will provide you with a greater depth of understanding in core aspects of geomorphology. The Advanced mode will culminate in a research-focussed Advanced Assignment. This is a unit for anyone wanting to better understand the planet on which they live, and who may wish to develop higher-level analytical and research skills in geomorphology and landscape analysis.

Textbooks

Allen, P.A., 2009. Earth surface processes. John Wiley and Sons. Scitech, 551.3 72 Sharma, V.K., 2010. Introduction to process geomorphology. CRC Press. Scitech, 551.41 113

SOIL2005
Soil and Water: Earth's Life Support Systems

Credit points: 6 **Teacher/Coordinator:** Prof Balwant Singh **Session:** Semester 1 **Classes:** Lectures: 3 hours per week; lab: 3 hours per week for 10 weeks **Prohibitions:** SOIL2003 or LWSC2002 **Assessment:** Field excursion: attendance and creative assessment (5%), the attendance at the excursion is complusory to get any mark for this assessment task; quiz: (10%); written assignment: modelling assessment including modelling (15%); laboratory report: group oral presentation and written assignment (20%); final exam: final written exam (50%) **Practical field work:** Approximately eight hours working field at Cobbitty Farm Wk 0 (Friday, 2 March 2018) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Soil and water are the two most essential natural resources on the Earth's surface which influence all forms of terrestrial life. This unit of study is designed to introduce students to the fundamental properties and processes of soil and water that affect food security and sustain ecosystems. These properties and processes are part of the grounding principles that underpin crop and animal production, nutrient and water cycling, and environmental sustainability. You will participate in a field excursion to examine soils in a landscape to develop knowledge and understanding of soil properties, water storage, water movement and cycling of organic carbon and nutrients in relation to food production and ecosystem functioning. At the end of this unit you will be able to articulate and quantify the factors and processes that determine the composition and behaviour of soil, composition of water, soil water storage and the movement of water on the land surface. You will also be able to describe the most important properties of soil and water for food production and sustaining ecosystem functions and link this to human and climatic factors. The field excursion, report and laboratory/computer exercises have been designed to develop communication, team work and collaborative efforts.

Textbooks

Brady, N.C. and Ray R. Weil. (2007). The Nature and Properties of Soils. 14th Edition, Prentice Hall, New Jersey. White, R.E. (2006) Principles and Practice of Soil Science: the Soil as a Natural Resource. 4th ed., Blackwell Science, Oxford. Diana H. Wall, Richard D. Bardgett, Valerie Behan-Pelletier, Jeffrey E. Herrick, T. Hefin Jones, Karl Ritz, Johan Six, Donald R. Strong, and Wim H. van der Putten (Eds.) (2012). Soil Ecology and Ecosystem Services. Oxford University Press, ISBN: 9780199575923. Kutllek, M and Nielsen, D.R. (2015). Soil: The Skin of the Planet Earth, Springer, ISBN: 978-94-017-9788-7 (Print) 978-94-017-9789-4 (Online). Gordon, N. D., McMahon, T. A., Finlayson, B. L., Gippel, C. J., and Nathan, R. J. (2004) Stream Hydrology: an Introduction for Ecologists, John Wiley and Sons Inc.

Major core

BIOL2032
Australian Wildlife Biology

Credit points: 6 **Teacher/Coordinator:** Dr Catherine Herbert **Session:** Semester 2 **Classes:** Three lectures; one 2-hour tutorial or practical session each week **Prohibitions:** ANSC2005 **Assessment:** Quizzes, presentation assignment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Australia is home to a broad diversity of vertebrate wildlife species, many of which are unique to the Australian environment, having evolved in isolation from other large land-masses for millions of years. This unit examines the diversity of Australian reptiles, amphibians, birds and mammals (including all three mammalian lineages; monotremes, marsupials and eutherian mammals). We focus on the unique anatomical, physiological and behavioural adaptations that have enabled our wildlife to survive and thrive within varied Australian ecosystems. We also examine how the uniqueness of our wildlife is also one of its greatest challenges, being naÂ¿ve to the new threats that are present in our rapidly changing environments. At the end of this unit you should have an appreciation of the diversity and uniqueness of Australian wildlife; be able to determine the links between form and function in wildlife and understand the significance of these functional adaptations in relation to ecological challenges. You will also have an understanding of the interactions between humans and wildlife, and how the unique characteristics of our wildlife also make them vulnerable to threats within the rapidly changing Australian environment. Students will also develop enhanced scientific literacy and communication skills through tutorial activities and assessment tasks.

Textbooks

No text book requirements. Recommended reading throughout semester provided by each lecture relevant to their class content. Relevant scientific papers will be uploaded to LMS

ENSC2001
Environmental Monitoring

Credit points: 6 **Teacher/Coordinator:** Prof Feike Dijkstra **Session:** Semester 1 **Classes:** One 2-hour lecture per week; one 3-hour computer/laboratory practical per week; one 1-hour tutorial every other week **Prohibitions:** AGCH3033 **Assumed knowledge:** Understanding of scientific principles and concepts including biodiversity, human impacts on the environment, properties of substances (e.g., acidity, alkalinity, solvents) and basic knowledge of statistics. **Assessment:** Group presentation (10%), quiz (10%), lab reports (30%), final exam (50%) **Practical field work:** Two half-day field trips **Mode of delivery:** Normal (lecture/lab/tutorial) day

Human population growth is causing irreversible change to almost all environments on earth. The extent of human change has been so great that a new geological epoch, the anthropocene, has been defined. Global warming, the introduction of pollutants and excessive use of nutrients are stressors affecting the biodiversity and resilience of ecosystems, and pose threats to human and environmental health. These human impacts carefully need to be monitored to guide appropriate management of urban, natural and agricultural systems. In this unit you will learn about transport pathways of pollutants, bioaccumulation, environmental toxicology (e.g., LD50 values), environmental monitoring and remediation techniques. Through lectures, laboratories and group work, concepts and methods of environmental monitoring will be illustrated and discussed including findings from the latest research. You will participate in structured practical exercises and field trips where you will apply sampling techniques, use bio-indicators and diversity indices to monitor ecosystem functioning. You will interpret the results and assess what the implications are for the ecological functioning and sustainable management of the environment. These hands-on exercises will be complemented with case-studies to guide you in critically analysing and evaluating environmental monitoring data. By taking this unit, you will acquire the necessary skills and knowledge in monitoring sites impacted by human activity.

Textbooks

Artiola, Pepper, and Brusseau. 2004. Environmental Monitoring and Characterization. Elsevier Academic Press.

3000-level units of study

Core

ENVX3001
Environmental GIS

Credit points: 6 **Teacher/Coordinator:** A/Prof Inakwu Odeh **Session:** Semester 2 **Classes:** Three-day field trip, (two lectures and two practicals per week) **Prerequisites:** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX **Assessment:** One 15-minute presentation (10%), 3500wd prac report (35%), 1500wd report on trip excursion (15%), 2-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to impart knowledge and skills in spatial analysis and geographical information science (GISc) for decision-making in an environmental context. The lecture material will present several themes: principles of GISc, geospatial data sources and acquisition methods, processing of geospatial data and spatial statistics. Practical exercises will focus on learning geographical information systems (GIS) and how to apply them to land resource assessment, including digital terrain modelling, land-cover assessment, sub-catchment modelling, ecological applications, and soil quality assessment for decisions regarding sustainable land use and management. A three day field excursion during the mid-semester break will involve a day of GPS fieldwork at Arthursleigh University farm and two days in Canberra visiting various government agencies which research and maintain GIS coverages for Australia. By the end of this UoS, students should be able to: differentiate between spatial data and spatial information; source geospatial data from government and private agencies; apply conceptual models of spatial phenomena for practical decision-making in an environmental context; apply critical analysis of situations to apply the concepts of spatial analysis to solving environmental and land resource problems; communicate effectively results of GIS investigations through various means- oral, written and essay formats; and use a major GIS software package such as ArcGIS.

Textbooks

Burrough, P.A. and McDonnell, R.A. 1998. Principles of Geographic Information Systems. Oxford University Press: Oxford.
Clarke, K. C. 2003. Getting Started With Geographic Information Systems. 4th Edition. Prentice Hall: Upper Saddle River, New Jersey.

GEOS3X19 and ENVI3XXX are to be developed for offering in 2019.

Selective

GEOS3102
Global Energy and Resources

Credit points: 6 **Teacher/Coordinator:** A/Prof Derek Wyman, Prof Dietmar Müller **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 2-hour tutorial/practicals per week. **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3802 or GEOS3003 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 or GEOS3903 **Assessment:** One 2-hour exam, practical and reports (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines the processes that form energy and mineral resources, outlines the characteristics of major fossil fuel and metal ore deposits and introduces the principles that underpin exploration strategies used to discover and develop geological resources. The unit will focus on a variety of topics including: coal; petroleum formation and migration, hydrocarbon traps and maturation; precious metal, base metal and gemstone deposit types; and exploration strategies. An integrated approach will relate tectonic processes through time to the formation of fossil fuel and mineral provinces. Practical exercises will introduce students to the techniques used to identify economically viable geological resources using a variety of exercises based on actual examples of resource exploration drawn from both the petroleum and minerals industry.

LWSC3007
Advanced Hydrology and Modelling

Credit points: 6 **Teacher/Coordinator:** A/Prof Willem Vervoort (Coordinator), Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** 2-hour lecture per week, 3-hour practical per week **Prerequisites:** LWSC2002 **Assessment:** Four practical assessments and reports (50%), take-home exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to allow students to examine advanced hydrological modeling focusing on catchment level responses and uncertainty. Students will learn how to develop their own simulation model of catchment hydrological processes in R and using SWAT and review the possibilities and impossibilities of using simulation models for catchment management. Students will further investigate landuse change impacts and climate change impacts the variability in hydrological responses. At the end of this unit, students will be able to calibrate and evaluate a catchment model, articulate advantages and disadvantages of using simulation models for catchment management, justify the choice of a simulation model for a particular catchment management problem, identify issues in relation to uncertainty in water quality and quantity The students will gain research and inquiry skills through research based assignments, information literacy and communication skills through laboratory reports and a presentation and personal and intellectual autonomy through working in groups.

Textbooks

Textbooks (Recommended reading)
Beven, K.J. Rainfall-Runoff modeling, The Primer, John Wiley and Sons, Chichester, 2001

SOIL3011 and AVBS3004 are to be developed for offering in 2019.

Environmental Studies

Study in the discipline of Environmental Studies is offered by the School of Geosciences in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

Environmental Studies is the examination of the social, economic and regulatory contexts that surround the management and monitoring of environmental and ecosystem health.

Environmental Studies incorporates the study of both social and bio-physical phenomena within their regulatory and policy frameworks, and is therefore inherently multi-disciplinary. It provides students with an understanding of the governance frames in which their professional careers in the environment sector will operate. It encapsulates the fundamental aspects of sustainability, environmental assessment, law, ethics, development, energy use, economics and politics. Consequently, the ENVI units are complementary to studies in the physical and natural science disciplines as well as social science disciplines.

Requirements for completion

A major in Environmental Studies requires 48 credit points, consisting of:

(i)6 credit points of 1000-level earth and life sciences units
(ii)6 credit points of 1000-level selective units
(iii)6 credit points of 2000-level core units
(iv)6 credit points of 2000-level selective units
(v)12 credit points of 3000-level core units
(vi)6 credit points of 3000-level selective units
(vii)6 credit points of 3000-level urban and South-East Asian context units

A minor in Environmental Studies is available and articulates to this major.

First year

The Environmental Studies major and minor is designed to be of value to students working across a range of disciplines in the life and environmental sciences. The first year is built around foundational units in biology and geosciences, with selective options in biology, chemistry, geosciences and environmental economics. These units provide a solid foundation for specialisation in later years.

Second year

In the second year, students are required to take GEOS2X21 as the core unit. This provides an essential conceptual framework for understanding interactions between humans and the rest of the earth system that is of value in at 3000-level. Selective options in environmental politics, resource economics, and natural hazards provide a broad, multi-disciplinary platform for understanding and critically analysing complex environmental and development issues.

Third year

In the third year of the Environmental Studies major, students are exposed to common legislative, normative, and procedural aspects of professional practice in the environmental and life sciences (ENVI3X11 and ENVI3X12). Selective units in energy (ENVI3114), environmental management and sustainability (GEOS3X14 and GEOS3X20), resource economics (ECOS3013) and field skills (GEOS3X53) provide a range of options to complement core training, strengthen specialisations, or compliment other majors/minors.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework

The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000 level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Environmental Studies: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://www.geosci.usyd.edu.au/index.shtml
E allyson.montenegro@sydney.edu.au
T +61 2 9351 4796

Address:
School of Geosciences
Room 348, Madsen Building F09
University of Sydney NSW 2006

Dr Jeff Neilson
T +61 2 9351 4733
E jeffery.neilson@sydney.edu.au

Learning Outcomes

Students who graduate from Environmental Studies will be able to:

1. Understand fundamental concepts and methods in natural and social sciences and their application to environmental issues;
2. Understand contemporary Australian regulatory and policy frameworks with respect to the natural environment and natural resources
3. Integrate and apply perspectives on complex environmental issues from the natural sciences, social sciences and humanities
4. Appreciate the ethical and broader contextual nature of environmental issues
5. Demonstrate proficiency in analytical methods and critical thinking, written and oral communication skills needed to conduct high-level work as an interdisciplinary scholar and/or professional.

Environmental Studies

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENVIRONMENTAL STUDIES			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Environmental Studies major			
A major in Environmental Studies requires 48 credit points from this table including: (i) 6 credit points of 1000-level earth and life sciences units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 12 credit points of 3000-level core units (vi) 6 credit points of 3000-level selective units (vii) 6 credit points of 3000 level urban and South-East Asian context units			
Environmental Studies minor			
A minor in Environmental Studies requires 36 credit points from this table including: (i) 6 credit points of 1000-level earth and life sciences units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 12 credit points of 3000-level urban and South-East Asian context units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Earth and life sciences units			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
GEOS1901 **Earth, Environment and Society Advanced**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 *Note: Department permission required for enrolment*	Semester 1
Selective			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
ENVI1003 **Global Challenges: Food, Water, Climate**	6		Semester 2
GEOS1002 **Introductory Geography**	6	**N** GEOS1902 or GEOG1001 or GEOG1002	Semester 2
GEOS1902 **Introductory Geography (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1002 or GEOG1001 or GEOG1002 *Note: Department permission required for enrolment*	Semester 2
AGEC1006 **Economic Environment of Agriculture**	6	**A** HSC Mathematics **N** AGEC1003 or AGEC1004	Semester 2
2000-level units of study			
Core			
GEOS2121 **Environmental and Resource Management**	6	**P** 6 credit points of first year Geosciences units or ECOP1001 or ECOP1002 **N** GEOS2921	Semester 2
GEOS2921 **Environmental and Resource Management (Adv)**	6	**P** A mark of 75 in a 6 credit point Junior Geosciences unit of study or a mark of 75 in ECOP1001 or ECOP1002 **N** GEOS2121	Semester 2
Selective			
GOVT2228 **Environmental Politics**	6	**P** 12 Junior credit points in Government and International Relations or 12 credit points at 1000 level in Politics or International Relations **N** GOVT2208	Semester 2
AREC2003 **Concepts in Enviro and Resource Economics**	6	**P** ECON1001 or ECON1040 or AREC1006 or AGEC1102	Semester 1
GEOS2111 **Natural Hazards: a GIS Approach**	6	**P** 6 credit points of Junior Geosciences units **N** GEOS2911 *Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.*	Semester 1
GEOS2911 **Natural Hazards: A GIS Approach (Adv)**	6	**P** A mark of 75 in a 6 credit point Junior Geosciences unit of study **N** GEOS2111 *Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.*	Semester 1
3000-level units of study			
Core			
ENVI3111 **Environmental Law and Ethics**	6	**P** 12 credit points of Intermediate units **N** ENVI3911	Semester 1
ENVI3911 **Environmental Law and Ethics (Advanced)**	6	**P** Distinction average across 12 credit points of Intermediate units **N** ENVI3111	Semester 1
ENVI3112 **Environmental Assessment**	6	**P** (GEOS2121 or GEOS2921) and 6 credit points of Intermediate units **N** ENVI3912	Semester 2
ENVI3912 **Environmental Assessment (Advanced)**	6	**P** Distinction average in ((GEOS2121 or GEOS2921) and 6 credit points of Intermediate units) **N** ENVI3112 *Supervised research project equivalent to the Literature Review in ENVI3112*	Semester 2
Selective			
ENVI3114 **Energy and the Environment**	6	**A** Junior Physics units or Intermediate Environmental Science units **P** 12 credit points of Intermediate units **N** ENVI3001 or PHYS3600	Semester 2
GEOS3014 **GIS in Coastal Management**	6	**P** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **N** GEOS3914 or MARS3104	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
GEOS3914 **GIS in Coastal Management (Advanced)**	6	**P** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **N** GEOS3014 or MARS3104 *Note: Department permission required for enrolment* *A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.*	Semester 2
ECOS3013 **Environmental Economics**	6	**P** AREC2003 or RSEC2031 or ECOS2001 or ECOS2901	Semester 2
Urban and South-East Asian context units			
GEOS3520 **Urban Citizenship and Sustainability**	6	**P** 24 credit points of Intermediate units of study, including 6 credit points from the following (GEOS2112 or GEOS2912 or GEOS2123 or GEOS2923 or GEOS2115 or GEOS2915 or GEOS2121 or GEOS2921 or SOILS2002 or LWSC2002) **N** GEOS3920	Semester 1
GEOS3920 **Urban Citizenship and Sustainability (Adv)**	6	**P** Distinction average in 24 credit points of Intermediate units of study including 6 credit points from one of the following units: GEOS2112, GEOS2912, GEOS2123, GEOS2923, GEOS2115, GEOS2915, GEOS2121, GEOS2921, SOIL2002, LWSC2002 **N** GEOS3520	Semester 1
GEOS3053 **Southeast Asia Field School**	6	**P** 6 credit points of Intermediate units of study in Geography. **N** GEOG3201 or GEOS3953 *Note: Department permission required for enrolment* *Students must contact the unit coordinator no later than September in the year before taking this unit.*	Intensive July
GEOS3953 **Southeast Asia Field School (Adv)**	6	**P** 6 credit points of Intermediate units of study in Geography. **N** GEOS3053 *Note: Department permission required for enrolment* *Students must contact the unit coordinator no later than September in the year before taking this unit.*	Intensive July

Environmental Studies

ENVIRONMENTAL STUDIES

Advanced coursework and projects will be available in 2020 for students who complete this major.

Environmental Studies major

A major in Environmental Studies requires 48 credit points from this table including:(i) 6 credit points of 1000-level earth and life sciences units (ii) 6 credit points of 1000-level selective units(iii) 6 credit points of 2000-level core units(iv) 6 credit points of 2000-level selective units(v) 12 credit points of 3000-level core units (vi) 6 credit points of 3000-level selective units(vii) 6 credit points of 3000 level urban and South-East Asian context units

Environmental Studies minor

A minor in Environmental Studies requires 36 credit points from this table including:(i) 6 credit points of 1000-level earth and life sciences units (ii) 6 credit points of 1000-level selective units(iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 12 credit points of 3000-level urban and South-East Asian context units

Units of study

The units of study are listed below.

1000-level units of study

Earth and life sciences units

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

GEOS1001
Earth, Environment and Society

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the gateway unit of study for Human Geography, Physical Geography, Environmental Studies and Geology. Its objective is to introduce the big questions relating to the origins and current state of the planet: climate change, environment, landscape formation, and the growth of the human population. During the semester you will be introduced to knowledge, theories and debates about how the world's physical and human systems operate. The first module investigates the evolution of the planet through geological time, with a focus on major Earth systems such as plate tectonics and mantle convection and their interaction with the atmosphere, hydrosphere, biosphere and human civilisations. The second module presents Earth as an evolving and dynamic planet, investigating global environmental change, addressing climate variability and human impacts on the natural environment and the rate at which these changes occur and how they have the potential to dramatically affect the way we live. Finally, the third module, focuses on human-induced challenges to Earth's future. This part of the unit critically analyses the relationships between people and their environments, with central consideration to debates on population change, resource use and the policy contexts of climate change mitigation and adaptation.

GEOS1901
Earth, Environment and Society Advanced

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1001, but will be required to carry out more challenging practical assignments.

Selective

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

CHEM1011

Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111

Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911

Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991

Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

ENVI1003
Global Challenges: Food, Water, Climate

Credit points: 6 **Teacher/Coordinator:** A/Prof Stephen Cattle **Session:** Semester 2 **Classes:** Two lectures per week, 2hour tutorial/computer lab per week, two-day weekend field trip **Assessment:** One 2-hour exam (50%), field trip report (15%), tutorial presentation (20%), GIS reports (15%) **Practical field work:** Computer practicals and two day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

In the 21st century the population of the world will increase both in size and its expectation in terms of food, energy and consumer demands. Against this demand we have a planet in crisis where natural resources are degraded, biodiversity is diminishing and planetary cycles related to climate are reaching points of irreversible change. Management of our precious natural resources is a balancing act between production and conservation as always, but now we have to do this against a background of potential large scale changes in climate. In this unit students will gain an understanding of the key environmental challenges of the 21st century; namely food security, climate change, water security, biodiversity protection, ecosystems services and soil security. In the second half using Australian case studies we will explore how we manage different agro-ecosystems within their physical constraints around water, climate and soil, while considering linkages with the global environmental challenges. Management now, in the past and the future will be considered, with an emphasis on food production. This unit is recommended unit for students interested in gaining a broad overview of the environmental challenges of the 21st century, both globally and within Australia.

GEOS1002
Introductory Geography

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson, Dr Dan Penny **Session:** Semester 2 **Classes:** One 2 hour lecture per week and eight 2 hour practicals during semester. **Prohibitions:** GEOS1902 or GEOG1001 or GEOG1002 **Assessment:** One 2 hour exam, one 2000 word essay, two online quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a geographical perspective on the ways in which people interact with each other and the physical world, focussing on the processes that generate spatial variation and difference. Students will consider the development and characteristics of natural environments across the globe, and will explore how these environments both constrain, and are influenced by, humans. In the process, they will learn about the biophysical, political, economic, cultural and urban geographies that shape contemporary global society. Each of these themes will be discussed with reference to key examples, in order to understand the ways in which the various processes (both physical and human) interact. The unit of study is designed to attract and interest students who wish to pursue geography as a major within their undergraduate degree, but also has relevance to students who wish to learn how to think geographically about the contemporary world.

GEOS1902
Introductory Geography (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson, Dr Dan Penny **Session:** Semester 2 **Classes:** One 2 hour lecture per week and 8 2 hour practicals per semester, plus independent group work. **Prohibitions:** GEOS1002 or GEOG1001 or GEOG1002 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** One 2 hour exam, one 1000 word essay, two online quizzes, one practical report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1002, but will be required to carry out more challenging practical assignments.

AGEC1006
Economic Environment of Agriculture

Credit points: 6 **Session:** Semester 2 **Classes:** 2x1hr lectures/week, 1x1hr tutorial/week **Prohibitions:** AGEC1003 or AGEC1004 **Assumed knowledge:** HSC Mathematics **Assessment:** 1x2hr exam (55%) and 1x50 min mid-semester exam (25%) and workshop papers (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to give an understanding of some basic economic principles and to introduce the characteristics of the economic environment in which Australian agriculture operates. Topics to be covered include the structure, nature and history of the agricultural industries in Australia; agricultural adjustment in the world economy; introductory principles of production economics and farm management; elementary price theory and the factors affecting the demand, supply and prices of agricultural commodities.

Textbooks

HE Drummond and JW Goodwin, Agricultural Economics, 3rd edn (Prentice-Hall, 2011)

2000-level units of study

Core

GEOS2121
Environmental and Resource Management

Credit points: 6 **Teacher/Coordinator:** Dr Sophie Webber **Session:** Semester 2 **Classes:** Two hour lecture; one hour tutorial per week **Prerequisites:** 6 credit points of first year Geosciences units or ECOP1001 or ECOP1002 **Prohibitions:** GEOS2921 **Assessment:** One exam, one essay, one report, tutorial attendance (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are in the midst of an unprecedented global ecological and climatological crisis, and consequently need to transform our social, political and economic systems. This crisis Â¿ its causes, its effects, and its solutions Â¿ are geographically unevenly distributed and situated. Therefore, this unit of study uses geographical concepts to consider what has caused this global crisis, how we should think about the relations and interactions between humans and their environments, and what some strategies are for managing our environment and resources to negotiate this predicament. Using examples focused in Australia, Asia, and the Pacific region, students will learn how to integrate environmental, economic, political, social and cultural considerations and perspectives, and how to evaluate environmental and resource management policies and ideas.

GEOS2921
Environmental and Resource Management (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Sophie Webber **Session:** Semester 2 **Classes:** Two hour lecture; one hour tutorial per week **Prerequisites:** A mark of 75 in a 6 credit point Junior Geosciences unit of study or a mark of 75 in ECOP1001 or ECOP1002 **Prohibitions:** GEOS2121 **Assessment:** One exam, one essay, one report, tutorial attendance (100%) **Practical field work:** Seminar, maximum of four hours **Mode of delivery:** Normal (lecture/lab/tutorial) day

Advanced students will receive the same core lecture materials as for GEOS2121 but have a separate seminar and are required to complete alternative written work.

Selective

GOVT2228
Environmental Politics

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** 12 Junior credit points in Government and International Relations or 12 credit points at 1000 level in Politics or International Relations **Prohibitions:** GOVT2208 **Assessment:** 1x1000wd Short Essay (20%), 1x2000wd Major Essay (40%), 1x1.5hr Examination (30%), 1xTutorial participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Environmental issues pose increasingly difficult challenges to our societies. What is the nature of these challenges? Where have they come from? How have political institutions adapted to them, at the national and international levels? What further changes might be necessary to better meet them? How might these changes come about? What effects might they have on the future of politics? This unit of study will engage these kinds of questions as an introduction to some theoretical and practical dimensions of environmental politics.

AREC2003
Concepts in Enviro and Resource Economics

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** ECON1001 or ECON1040 or AREC1006 or AGEC1102 **Assessment:** 1x50min Mid-semster test (20%), 2x1000wd Assignments (30%), 1x2hr Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit builds on the concepts in microeconomics to provide insights into efficient and sustainable resource management. The primary focus of this unit is analytical. Emphasis is placed on the importance of property rights structures, cost-effective regulations and dynamic considerations in managing natural resource stocks and environmental assets. Some introductory material on economic valuation of environmental assets and benefit cost analysis is included.

GEOS2111
Natural Hazards: a GIS Approach

Credit points: 6 **Teacher/Coordinator:** A/Prof Dale Dominey-Howes **Session:** Semester 1 **Classes:** Two hour lecture; two hour practical/tute/lab **Prerequisites:** 6 credit points of Junior Geosciences units **Prohibitions:** GEOS2911 **Assessment:** One 2 hour exam, three reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.

The unit provides an essential framework for understanding the environmental response to short- and long-term geologic, oceanic and atmospheric processes. This Unit of Study introduces students to a variety of natural phenomena that affect society with impact levels ranging from nuisance to disastrous. The discussion of each hazard focuses on: (1) the process mechanics, (2) hazards and risk, and (3) methods for mitigation. Geographic Information Systems (GIS) are used by scientists, planners, policy-makers and the insurance industry alike to address many issues relating to natural hazards. This Unit of Study will introduce students to the major concepts relating to GIS and provide practical experience in the application of GIS techniques to hazard mapping, risk assessment and mitigation.

Textbooks

No prescribed textbook

GEOS2911
Natural Hazards: A GIS Approach (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dale Dominey-Howes **Session:** Semester 1 **Classes:** Two hour lecture; two hour practical/tute/lab **Prerequisites:** A mark of 75 in a 6 credit point Junior Geosciences unit of study **Prohibitions:** GEOS2111 **Assessment:** One 2 hour exam, three reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.

This unit has the same objectives as GEOS2111 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives.

Textbooks

No set textbook

3000-level units of study

Core

ENVI3111
Environmental Law and Ethics

Credit points: 6 **Teacher/Coordinator:** Dr Josephine Gillespie **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate units **Prohibitions:** ENVI3911 **Assessment:** Essays, in-class tests, tutorials, exam (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Environmental regulation and governance plays an important role in regulating human impacts on the environment. This unit provides an introduction to environmental regulation. We investigate key environmental issues through an examination of environmental policies, legislation and case law at a variety of scales (international, national and state/local). The ethics component helps students develop thoughtful and informed positions on issues in environmental ethics. The aim of this Unit is to enable students to understand the broad principles of environmental law and ethics and to apply this understanding to contemporary environmental problems.

ENVI3911
Environmental Law and Ethics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Josephine Gillespie **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Distinction average across 12 credit points of Intermediate units **Prohibitions:** ENVI3111 **Assessment:** Essays, tutorial attendance, exam (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This advanced unit of study will cover the same core lecture material as for ENVI3111, but students will be required to carry out more challenging practical assignments based on a fieldtrip activity.

ENVI3112
Environmental Assessment

Credit points: 6 **Teacher/Coordinator:** Prof Phil McManus **Session:** Semester 2 **Classes:** One 2-hour lecture per week and one 2-hour tutorial/practical per week. **Prerequisites:** (GEOS2121 or GEOS2921) and 6 credit points of Intermediate units **Prohibitions:** ENVI3912 **Assessment:** Literature review, group report, presentation, exam (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study focuses on environmental impact assessment as part of environmental planning. It seeks to establish a critical understanding of environmental planning and the tools available to improve environmental outcomes. The unit of study addresses the theory and practice of environmental impact statements (EIS) and environmental impact assessment processes (EIA) from scientific, economic, social and cultural value perspectives. Emphasis is placed on gaining skills in group work and in writing and producing an assessment report, which contains logically ordered and tightly structured argumentation that can stand rigorous scrutiny by political processes, the judiciary, the public and the media.

ENVI3912
Environmental Assessment (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Phil McManus **Session:** Semester 2 **Classes:** One 2-hour lecture per week and one 2-hour tutorial/practical per week. **Prerequisites:** Distinction average in ((GEOS2121 or GEOS2921) and 6 credit points of Intermediate units) **Prohibitions:** ENVI3112 **Assessment:** Research project, group report, presentation, exam (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Supervised research project equivalent to the Literature Review in ENVI3112

This advanced unit of study will cover the same core lecture, tutorial and group practical material as for ENVI3112. The difference in the Advanced unit of study is that students will be required to write a 3000-word essay that is worth 40% of their semester marks, rather than writing a literature review. The essay will explore the more theoretical and conceptual debates within impact assessment.

Selective

ENVI3114
Energy and the Environment

Credit points: 6 **Teacher/Coordinator:** Dr Arne Geschke **Session:** Semester 2 **Classes:** 2-hour lecture and 1 hour seminar per week; field trips **Prerequisites:** 12 credit points of Intermediate units **Prohibitions:** ENVI3001 or PHYS3600 **Assumed knowledge:** Junior Physics units or Intermediate Environmental Science units **Assessment:** Essay, comprehensive diary/notes from lectures, and presentation (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers many aspects of energy and the environment: energy resources and use; electrical power generation including fossil fuelled and alternate methods; environmental impacts of energy use and power generation including greenhouse gas emissions; transportation and pollution; energy management in buildings; solar thermal energy, photovoltaics, wind power and nuclear energy; embodied energy and net emissions analysis and, importantly, socio-economic and political issues related to energy provision.

GEOS3014
GIS in Coastal Management

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** 2x1 hour lectures and 1x3h practical/week **Prerequisites:** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **Prohibitions:** GEOS3914 or MARS3104 **Assessment:** One 2 hour exam, two project reports, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Coastal Management is about how scientific knowledge is used to support policy formulation and planning decisions in coastal environments. The course links coastal science to policy and practice in management of estuaries, beaches and the coastal ocean. The principles are exemplified through specific issues, such as coastal erosion, pollution, and impacts of climate-change. The issues are dealt with in terms of how things work in nature, and how the issues are handled through administrative mechanisms. These mechanisms involve planning strategies like Marine Protected Areas and setback limits on civil development in the coastal zone. The coastal environments and processes that are more relevant to coastal management including: rocky coasts; beaches, barriers and dunes; and coral reefs will also be introduced. At a practical level, the link between science and coastal management is given substance through development and use of 'decision-support models'. These models involve geocomputing methods that entail application of simulation models, remotely sensed information, and Geographic Information Systems (GIS). The course therefore includes both principles and experience in use of these methods to address coastal-management issues. (It thus also involves extensive use of computers.) Although the focus is on the coast, the principles and methods have broader relevance to environmental management in particular, and to problem-solving in general. That is, the course has vocational relevance in examining how science can be exploited to the benefit of society and nature conservation.

GEOS3914
GIS in Coastal Management (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** Two hours of lectures, one 3 hour practical per week comprising one 1 hour practical demonstration and one 2 hour practical **Prerequisites:** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **Prohibitions:** GEOS3014 or MARS3104 **Assessment:** One 2 hour exam, project work, two practical-based project reports, fortnightly progress quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3014 but will carry out more challenging projects, practicals, assignments and tutorials.

ECOS3013
Environmental Economics

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** AREC2003 or RSEC2031 or ECOS2001 or ECOS2901 **Assessment:** 1x1500wd Essay (25%), 1hr Mid-semester test (25%), 1x2hr Final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The natural environment is invariably affected by production and consumption in our modern economy. In particular, environmental outcomes are important in the presence of market failures (externalities and public goods). This unit focuses on developing a student's detailed understanding of the economic techniques used by policymakers to address environmental issues. These techniques include: Pigovian taxes and subsidies; regulation with asymmetric information; marketable permits; pricing contributions for public goods; optimal damages; and the allocation of property-rights and market failures.

Urban and South-East Asian context units

GEOS3520
Urban Citizenship and Sustainability

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** 2 hour lecture and 1 hour tutorial per week, six 2 hours practical sessions. **Prerequisites:** 24 credit points of Intermediate units of study, including 6 credit points from the following (GEOS2112 or GEOS2912 or GEOS2123 or GEOS2923 or GEOS2115 or GEOS2915 or GEOS2121 or GEOS2921 or SOILS2002 or LWSC2002) **Prohibitions:** GEOS3920 **Assessment:** One 2hr exam, one 2000w essay, one 2000w group-based prac report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cities are now the predominant home for humanity. More than half of the world's population reside in cities. The contemporary growth of cities, however, is attached to profound political questions about what it means to be urban, and what 'being urban' means for the planet. This Unit of Study provides grounding to these crucial questions. In the first half of the semester, lectures address the question: are cities sustainable? Why or why not? And for whom? This focus addresses utopian visions for cities, urban history, ecological footprint analysis, bioregionalism, transport options, urban form and urban policy, with reference to sustainable futures and the role of custodianship. During the second half of the semester, lectures address the question: what does it mean to be a 'citizen', and what has this got to do with cities and different approaches to urban sustainability? This includes consideration of historical and contemporary configurations of citizenship. Case studies illustrate ways in which new forms of citizenship are produced through struggles over rights to the city and the urban environment. Through the semester a practicals program enables students to develop urban-based research projects.

GEOS3920
Urban Citizenship and Sustainability (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** 2 hour lecture and 2 hour tutorial per week **Prerequisites:** Distinction average in 24 credit points of Intermediate units of study including 6 credit points from one of the following units: GEOS2112, GEOS2912, GEOS2123, GEOS2923, GEOS2115, GEOS2915, GEOS2121, GEOS2921, SOIL2002, LWSC2002 **Prohibitions:** GEOS3520 **Assessment:** One 2hr exam, one 2000w essay, one 2000w group-based prac report. **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS3920 has the same thematic content as GEOS3520 however with elements taught at an Advanced level

GEOS3053
Southeast Asia Field School

Credit points: 6 **Teacher/Coordinator:** Dr Jeff Neilson **Session:** Intensive July **Classes:** 3 pre-departure classes during Semester 1, up to three weeks in-country intensive involving lectures, fieldwork and field-based methods training, readings and small group discussions **Prerequisites:** 6 credit points of Intermediate units of study in Geography. **Prohibitions:** GEOG3201 or GEOS3953 **Assessment:** Group participation, one consolidation report, one exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Students must contact the unit coordinator no later than September in the year before taking this unit.

The unit of study can be taken only with prior permission from the unit of study coordinator. It constitutes a Field School run over a two to three week period in July, prior to the commencement of the second semester. In 2016, the Field School will be held in Indonesia. In other years it may be held in mainland Southeast Asia. The Field School focuses on three main themes; rural social, environmental and economic change; regional economic integration and its local effects; regional environmental change and natural resources governance. The Field School is run in close association with local universities, whose staff and students participate in some components of the course. Places are limited, and students interested in the 2016 Field School should indicate expression of interest to Dr Jeff Neilson by 26th September 2015.

GEOS3953
Southeast Asia Field School (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Jeff Neilson **Session:** Intensive July **Classes:** 3 pre-departure classes during Semester 1, up to three weeks in-country intensive involving lectures, fieldwork and field-based methods training, readings and small group discussions **Prerequisites:** 6 credit points of Intermediate units of study in Geography. **Prohibitions:** GEOS3053 **Assessment:** Group participation, one consolidation report, one exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Students must contact the unit coordinator no later than September in the year before taking this unit.

The unit of study can be taken only with prior permission from the unit of study coordinator. It constitutes a Field School run over a two to three week period in July, prior to the commencement of the second semester. In 2016, the Field School will be held in Indonesia. In other years it may be held in mainland Southeast Asia. The Field School focuses on three main themes; rural social, environmental and economic change; regional economic integration and its local effects; regional environmental change and natural resources governance. The Field School is run in close association with local universities, whose staff and students participate in some components of the course. Places are limited, and students interested in the 2016 Field School should indicate expression of interest to Dr Jeff Neilson by 26th September 2015.

Financial Mathematics and Statistics

Study in the discipline of Financial Mathematics and Statistics is offered by the School of Mathematics and Statistics in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

Financial mathematics and statistics is designed to meet the needs of a particularly popular area of employment for our mathematics graduates. Mathematics is the foundation of the financial world. It allows investors, traders and bankers to make optimal decisions and to distribute risk in a rational way. The mathematics behind finance is, however, not simple and relies heavily on ideas from statistics and the mathematical theory of random events.

Financial Mathematics and Statistics will give you a broad introduction to the methods and ideas of mathematical finance and will prepare you for employment in the financial sector or for honours and further study in the field.

Requirements for completion

A major in Financial Mathematics and Statistics requires 48 credit points, consisting of:

(i)12 credit points of 1000 level units according to the following rules:

- (a)6 credit points of calculus units; 3 credit points of linear algebra units and 3 credit points of statistics units; or
- (b)3 credit points of calculus units; 3 credit points of linear algebra units and 6 credit points of data science units

(ii)12 credit points of 2000-level core units
(iii)12 credit points of 3000-level interdisciplinary project and core units
(iv)6 credit points of 3000-level statistical modelling units
(v)6 credit points of 3000-level mathematical modelling units

A minor in Financial Mathematics and Statistics is available and articulates to this major.

First year

MATH1021/1921/1931, MATH1023/1923/1933 and MATH1002/1902, and either MATH1005/1905 or DATA1001.

The first year units provide a strong foundation for further learning and a broad introduction to the Mathematical Sciences. MATH1021/1921/1931 and MATH1023/1923/1933 extend your knowledge of calculus and introduce you to calculus of several variables and mathematical modelling with differential equations. MATH1002/1902 introduces you to linear algebra, including matrices and their applications. MATH1005/1905 and DATA1001 both introduce you to working with data.

Second year

Core: MATH2070/2970 and STAT2011/2911

The second year units provide core specialist knowledge and skills in Financial Mathematics and Statistics. STAT2011/2911 provides foundational knowledge of random processes and probability while MATH2070/2970 introduces you to mathematical optimisation and the foundations of financial mathematics.

Third year

MATH3970/MATH3070 and STAT3021 and a 3000-level project unit and a selection of 6 credit points from MATH3979, MATH3076/3976, STAT3023 and STAT3022/3922

In your third year you must take the designated project unit. You must also take MATH3970/3070 which introduces you to the world of financial derivatives and STAT3021 which gives you the tools to understand highly variable financial markets. The fourth unit at third year level can be chosen from a selection of MATH and STAT units depending on your particular interests.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework

The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours

Students who complete a major in Financial Mathematics and Statistics may go on to honours in either Applied Mathematics or Statistics, depending on their interests and the units that they have chosen in their third year. Both Applied Mathematics and Statistics honours require 24 credit points of coursework and 24 credit points of project work.

Honours units of study will be available in 2020.

Contact and further information

W www.maths.usyd.edu.au/
First year enquiries email: firstyear@maths.usyd.edu.au
Other undergraduate enquiries email: ug-enq@maths.usyd.edu.au
All enquiries phone: +61 2 9351 5804 or +61 2 9351 5787

School of Mathematics and Statistics
Level 5, Carslaw Building F07
University of Sydney NSW 2006

Professor Mary Myerscough
T 9351 3724
E mary.myerscough@sydney.edu.au

Learning Outcomes

Students who graduate from Financial Mathematics and Statistics will be able to:

1. Construct logical, clearly presented and justified arguments incorporating deductive reasoning.
2. Understand principles and concepts of a broad range of fundamental areas in mathematics and statistics with a particular focus on optimisation, risk analysis and stochastic processes.
3. Formulate and model practical and abstract problems in mathematical terms using a variety of methods.
4. Apply mathematical principles, concepts, techniques and technology to solve practical and abstract problems and interpret results critically with particular focus on problems that arise in the context of the financial sector.
5. Appropriately interpret information communicated in mathematical or statistical form.
6. Appropriately present information, reasoning and conclusions in a variety of modes, to diverse audiences (expert and non-expert).

Financial Mathematics and Statistics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
FINANCIAL MATHEMATICS AND STATISTICS			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Financial Mathematics and Statistics major			
A major in Financial Mathematics and Statistics requires 48 credit points from this table including: (i) 12 credit points of 1000 level units according to the following rules: (a) 6 credit points of calculus units; 3 credit points of linear algebra units and 3 credit points of statistics units; or (b) 3 credit points of calculus units; 3 credit points of linear algebra units and 6 credit points of data science units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level interdisciplinary project and core units (iv) 6 credit points of 3000-level statistical modelling units (v) 6 credit points of 3000-level mathematical modelling units			
Financial Mathematics and Statistics minor			
A minor in Financial Mathematics and Statistics requires 36 credit points from this table including: (i) 12 credit points of 1000 level units according to the following rules: (a) 3 credit points of 1000-level calculus units; 3 credit points of multivariable calculus units; 3 credit points of linear algebra units and 3 credit points of statistics units; or (b) 6 credit points of data science units; 3 credit points of calculus units and 3 credit points of linear algebra units (ii) 12 credit points of 2000-level core units (iii) 6 credit points of 3000-level core units (iv) 6 credit points of 3000-level statistical modelling units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Calculus units			
MATH1021 **Calculus Of One Variable**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931	Semester 1
MATH1921 **Calculus Of One Variable (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 *Note: Department permission required for enrolment*	Semester 1
MATH1931 **Calculus Of One Variable (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 1
Multivariable calculus units			
MATH1023 **Multivariable Calculus and Modelling**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933	Semester 2
MATH1923 **Multivariable Calculus and Modelling (Adv)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 *Note: Department permission required for enrolment*	Semester 2
MATH1933 **Multivariable Calculus and Modelling (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 2
Statistics units			
MATH1005 **Statistical Thinking with Data**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020	Semester 2 Summer Main Winter Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MATH1905 **Statistical Thinking with Data (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 *Note: Department permission required for enrolment*	Semester 2
MATH1015 **Biostatistics**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020	Semester 1
Linear algebra units			
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1012 or MATH1014 or MATH1902	Semester 1 Summer Main
MATH1902 **Linear Algebra (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1002 or MATH1012 or MATH1014 *Note: Department permission required for enrolment*	Semester 1
Data science units			
DATA1001 **Foundations of Data Science**	6	**N** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021	Semester 1 Semester 2
2000-level units of study			
Core			
MATH2070 **Optimisation and Financial Mathematics**	6	**A** MATH1X23 or MATH1933 or MATH1X03 or MATH1907 **P** (MATH1X21 or MATH1011 or MATH1931 or MATH1X01 or MATH1906) and (MATH1014 or MATH1X02) **N** MATH2010 or MATH2033 or MATH2933 or MATH2970 or ECMT3510 *Students may enrol in both MATH2070 and MATH3075 in the same semester*	Semester 2
MATH2970 **Optimisation and Financial Mathematics Adv**	6	**A** MATH19X3 or MATH1907 or a mark of 65 or above in MATH1003 or MATH1023 **P** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **N** MATH2010 or MATH2033 or MATH2933 or MATH2070 or ECMT3510 *Students may enrol in both MATH2970 and MATH3975 in the same semester*	Semester 2
STAT2011 **Probability and Estimation Theory**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **N** STAT2901 or STAT2001 or STAT2911	Semester 1
STAT2911 **Probability and Statistical Models (Adv)**	6	**P** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **N** STAT2001 or STAT2901 or STAT2011	Semester 1
3000-level units of study			
Interdisciplinary project and major core units			
MATH3070, MATH3970, STAT3021 to be developed for offering in 2019.			
Mathematical modelling units			
MATH3076 **Mathematical Computing**	6	**P** 12 credit points of MATH2XXX and 6 credit points from (MATH1021 or MATH1001 or MATH1023 or MATH1003 or MATH19X1 or MATH19X3 or MATH1906 or MATH1907) **N** MATH3976 or MATH3016 or MATH3916	Semester 1
MATH3976 **Mathematical Computing (Advanced)**	6	**P** 12 credit points of MATH2XXX and [6 credit points from (MATH1923 or MATH1903 or MATH1933 or MATH1907), or a mark of 65 or above in (MATH1023 or MATH1003)] **N** MATH3076 or MATH3016 or MATH3916	Semester 1
MATH3979 to be developed for offering in 2019.			
Statistical modelling units			
STAT3023, STAT3022 and STAT3922 to be developed for offering in 2019.			
Minor core			
MATH3X70 to be developed for offering in 2019.			

Financial Mathematics and Statistics

FINANCIAL MATHEMATICS AND STATISTICS

Advanced coursework and projects will be available in 2020 for students who complete this major.

Financial Mathematics and Statistics major

A major in Financial Mathematics and Statistics requires 48 credit points from this table including:(i) 12 credit points of 1000 level units according to the following rules: (a) 6 credit points of calculus units; 3 credit points of linear algebra units and 3 credit points of statistics units; or(b) 3 credit points of calculus units; 3 credit points of linear algebra units and 6 credit points of data science units(ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level interdisciplinary project and core units (iv) 6 credit points of 3000-level statistical modelling units(v) 6 credit points of 3000-level mathematical modelling units

Financial Mathematics and Statistics minor

A minor in Financial Mathematics and Statistics requires 36 credit points from this table including:(i) 12 credit points of 1000 level units according to the following rules: (a) 3 credit points of 1000-level calculus units; 3 credit points of multivariable calculus units; 3 credit points of linear algebra units and 3 credit points of statistics units; or(b) 6 credit points of data science units; 3 credit points of calculus units and 3 credit points of linear algebra units(ii) 12 credit points of 2000-level core units(iii) 6 credit points of 3000-level core units(iv) 6 credit points of 3000-level statistical modelling units

Units of study

The units of study are listed below.

1000-level units of study

Calculus units

MATH1021
Calculus Of One Variable

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals.

Textbooks
As set out in the Junior Mathematics Handbook.

MATH1921
Calculus Of One Variable (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals. Additional theoretical topics included in this advanced unit include the Intermediate Value Theorem, Rolle's Theorem, and the Mean Value Theorem.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1931
Calculus Of One Variable (SSP)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1921 Calculus of One Variable (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

Multivariable calculus units

MATH1023
Multivariable Calculus and Modelling

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1923
Multivariable Calculus and Modelling (Adv)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable. Additional topics covered in this advanced unit of study include the use of diagonalisation of matrices to study systems of linear equation and optimisation problems, limits of functions of two or more variables, and the derivative of a function of two or more variables.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1933
Multivariable Calculus and Modelling (SSP)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1923 Multivariable Calculus and Modelling (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

Statistics units

MATH1005
Statistical Thinking with Data

Credit points: 3 **Session:** Semester 2, Summer Main, Winter Main **Classes:** Lectures 2 hrs/week; Practical 1 hr/week **Prohibitions:** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In a data-rich world, global citizens need to problem solve with data, and evidence based decision-making is essential is every field of research and work.

This unit equips you with the foundational statistical thinking to become a critical consumer of data. You will learn to think analytically about data and to evaluate the validity and accuracy of any conclusions drawn. Focusing on statistical literacy, the unit covers foundational statistical concepts, including the design of experiments, exploratory data analysis, sampling and tests of significance.

Textbooks

Freedman, Pisani and Purves, Statistics, Norton, 2007

MATH1905
Statistical Thinking with Data (Advanced)

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. This Advanced level unit of study parallels the normal unit MATH1005 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1015
Biostatistics

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1015 is designed to provide a thorough preparation in statistics for students in the Biological and Medical Sciences. It offers a comprehensive introduction to data analysis, probability and sampling, inference including t-tests, confidence intervals and chi-squared goodness of fit tests.

Textbooks

As set out in the Junior Mathematics Handbook

Linear algebra units

MATH1002
Linear Algebra

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1014 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1002 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study introduces vectors and vector algebra, linear algebra including solutions of linear systems, matrices, determinants, eigenvalues and eigenvectors.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1902
Linear Algebra (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1002 or MATH1012 or MATH1014 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. It parallels the normal unit MATH1002 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

Data science units

DATA1001
Foundations of Data Science

Credit points: 6 **Teacher/Coordinator:** Dr Di Warren **Session:** Semester 1, Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prohibitions:** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021 **Assessment:** assignments, quizzes, presentation, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

DATA1001 is a foundational unit in the Data Science major. The unit focuses on developing critical and statistical thinking skills for all students. Does mobile phone usage increase the incidence of brain tumours? What is the public's attitude to shark baiting following a fatal attack? Statistics is the science of decision making, essential in every industry and undergirds all research which relies on data. Students will use problems and data from the physical, health, life and social sciences to develop adaptive problem solving skills in a team setting. Taught interactively with embedded technology, DATA1001 develops critical thinking and skills to problem-solve with data. It is the prerequisite for DATA2002.

Textbooks

Statistics, Fourth Edition, Freedman Pisani Purves

2000-level units of study

Core

MATH2070
Optimisation and Financial Mathematics

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** (MATH1X21 or MATH1011 or MATH1931 or MATH1X01 or MATH1906) and (MATH1014 or MATH1X02) **Prohibitions:** MATH2010 or MATH2033 or MATH2933 or MATH2970 or ECMT3510 **Assumed knowledge:** MATH1X23 or MATH1933 or MATH1X03 or MATH1907 **Assessment:** One 2 hour exam, assignments, quiz, project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students may enrol in both MATH2070 and MATH3075 in the same semester

Problems in industry and commerce often involve maximising profits or minimising costs subject to constraints arising from resource limitations. The first part of this unit looks at programming problems and their solution using the simplex algorithm; nonlinear optimisation and the Kuhn Tucker conditions.

The second part of the unit deals with utility theory and modern portfolio theory. Topics covered include: pricing under the principles of expected return and expected utility; mean-variance Markowitz portfolio theory, the Capital Asset Pricing Model, log-optimal portfolios and the Kelly criterion; dynamical programming. Some understanding of probability theory including distributions and expectations is required in this part.

Theory developed in lectures will be complemented by computer laboratory sessions using MATLAB. Minimal computing experience will be required.

MATH2970
Optimisation and Financial Mathematics Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week (lectures given in common with MATH2070). **Prerequisites:** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **Prohibitions:** MATH2010 or MATH2033 or MATH2933 or MATH2070 or ECMT3510 **Assumed knowledge:** MATH19X3 or MATH1907 or a mark of 65 or above in MATH1003 or MATH1023 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students may enrol in both MATH2970 and MATH3975 in the same semester

The content of this unit of study parallels that of MATH2070, but students enrolled at Advanced level will undertake more advanced problem solving and assessment tasks, and some additional topics may be included.

STAT2011
Probability and Estimation Theory

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory week. **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **Prohibitions:** STAT2901 or STAT2001 or STAT2911 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to univariate techniques in data analysis and the most common statistical distributions that are used to model patterns of variability. Common discrete random models like the binomial, Poisson and geometric, continuous models including the normal and exponential will be studied along with elementary regression models. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2911
Probability and Statistical Models (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **Prohibitions:** STAT2001 or STAT2901 or STAT2011 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an advanced version of STAT2011, with an emphasis on the mathematical techniques used to manipulate random variables and probability models. Common distributions including the Poisson, normal, beta and gamma families as well as the bivariate normal are introduced. Moment generating functions and convolution methods are used to understand the behaviour of sums of random variables. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The notions of conditional expectation and prediction will be covered as will be distributions related to the normal: chi^2, t and F. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

3000-level units of study

Interdisciplinary project and major core units

MATH3070, MATH3970, STAT3021 to be developed for offering in 2019.

Mathematical modelling units

MATH3076
Mathematical Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour laboratory per week. **Prerequisites:** 12 credit points of MATH2XXX and 6 credit points from (MATH1021 or MATH1001 or MATH1023 or MATH1003 or MATH19X1 or MATH19X3 or MATH1906 or MATH1907) **Prohibitions:** MATH3976 or MATH3016 or MATH3916 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to Fortran 95/2003 programming and numerical methods. Topics covered include computer arithmetic and computational errors, systems of linear equations, interpolation and approximation, solution of nonlinear equations, quadrature, initial value problems for ordinary differential equations and boundary value problems.

MATH3976
Mathematical Computing (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of MATH2XXX and [6 credit points from (MATH1923 or MATH1903 or MATH1933 or MATH1907), or a mark of 65 or above in (MATH1023 or MATH1003)] **Prohibitions:** MATH3076 or MATH3016 or MATH3916 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

See entry for MATH3076 Mathematical Computing.

MATH3979 to be developed for offering in 2019.

Statistical modelling units

STAT3023, STAT3022 and STAT3922 to be developed for offering in 2019.

Minor core

MATH3X70 to be developed for offering in 2019.

Food and Agribusiness

About the program

The Food and Agribusiness stream will equip you with a solid grounding in the underpinning science of food products and processes, combined with studies of the business or economics environment that drive commercial processes and decisions.

The stream will develop your analytical, problem-solving and research skills, as well as contextual knowledge of food and agribusiness, with a strong emphasis on industry relevance and engagement. There is a high demand in the food and agribusiness sector for tertiary graduates to enter skilled employment and support productivity, research and innovation. The Food and Agribusiness stream offers a good foundation for such roles.

Requirements for completion

The Food and Agribusiness stream is 156 credit points, consisting of:

(i)6 credit points of 1000-level degree core units
(ii)6 credit points of 2000-level degree core units
(iii)A 96 credit point program in Food and Agribusiness
(iv)A major from Table S in one of the following: Economics, Economic Policy, Agricultural and Resource Economics, Financial Economics, Econometrics, Accounting, Banking, Business Analytics, Business Information Systems, Business Law, Finance, Industrial Relations and Human Resource Management, International Business, Management or Marketing

The program in Food and Agribusiness requires 96 credit points, consisting of:

(i)6 credit points of 1000-level program core units
(ii)6 credit points of 2000-level program core units
(iii)24 credit points of 4000-level core units
(iv)6 credit points of 4000-level internship units
(v)6 credit points of 4000-level advanced coursework units
(vi)A 48 credit point major in Food Science

First year

Core to Food Science Major: BIOL1XX7, CHEM1XX1
Core to Program: ENVI1003
Core to Stream: ENVX1002

The first year of Food and Agribusiness includes fundamental studies in biology, chemistry, statistics, and business or economics. The program core unit will help to situate your studies in the context of global challenges in sustainable food and resource management.

Students also complete electives and 1000-level units towards their Table S major.

Second year

Core to Major: AGEN2002, BCMB2X01
Core to Program: ITLS2000
Core to Stream: ENVX2001

The second year of Food and Agribusiness includes studies in food science and supply chain management. You undertake further studies in statistics and your business or economics major. In addition, you study biochemistry and molecular biology, which links food to human health and nutrition.

Students also complete electives and 2000-level units towards their Table S major.

Third year

Core to Major: AGEN3004, AGCH3025, AGEN3001, AGEN3XXX

The third year of Food and Agribusiness includes studies in food processing, food chemistry and biochemistry, food product development, and food quality and safety.

Students also complete electives and 3000-level units towards their Table S major.

Fourth year

Core to Program: AFNR4101 (12cp), AFNR4102 (12cp), FOOD4XX1, FOOD4XX2

The fourth year of Food and Agribusiness includes a major research project completed as a 12cp unit per semester over two semesters. You also undertake an industry internship, advanced food science coursework, and complete your business or economics major.

Honours
Requirements for Honours in the area of Food and Agribusiness: completion of 24 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 02 9351 4262

School of Life and Environmental Sciences
Level 5, Carslaw Building F07
University of Sydney NSW 2006

Dr Kim-Yen Phan-Thien
T +61 2 8627 1049
E kim-yen.phan-thien@sydney.edu.au

Learning Outcomes

Students who graduate from Food and Agribusiness will be able to:

1. Demonstrate knowledge of the core sciences in the context of food science.
2. Understand how knowledge from food science is integrated and applied in industry practices.
3. Demonstrate broad knowledge of commerce in the food and agribusiness context, with specialist knowledge in one area.
4. Demonstrate basic knowledge of agriculture and social science as they apply in food and agribusiness value chains.
5. Explain the role and relevance of food and agribusiness in society.
6. Understand the major biophysical, economic, social and policy drivers that underpin and influence food production, management and business practices.
7. Understand how information is adopted and the context within which value chain actors make decisions.
8. Identify contemporary issues and opportunities in food and agribusiness.
9. Gather, critically evaluate and synthesise information from a range of relevant sources and disciplines.
10. Select and apply appropriate and/or theoretical techniques or tools in order to conduct an investigation.
11. Collect, accurately record, analyse, interpret and report data.
12. Understand methods of effective two-way written and verbal communication with different audiences.
13. Communicate with a range of audiences using a variety of modes.
14. Be independent and self-directed learners.
15. Work effectively, responsibly and safely in an individual and team context.
16. Demonstrate knowledge of the regulatory frameworks relevant to food and agribusiness.
17. Practise ethical conduct.

Food and Agribusiness

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
FOOD AND AGRIBUSINESS			
Food and Agribusiness stream			
The Food and Agribusiness stream is 156 credit points, consisting of: (i) 6 credit points of 1000-level degree core units (ii) 6 credit points of 2000-level degree core units (iii) A 96 credit point program in Food and Agribusiness (iv) A major from Table S in one of the following: Economics, Economic Policy, Agricultural and Resource Economics, Financial Economics, Econometrics, Accounting, Banking, Business Analytics, Business Information Systems, Business Law, Finance, Industrial Relations and Human Resource Management, International Business, Management or Marketing			
Food and Agribusiness program			
This program is only available to students enrolled in Food and Agribusiness stream.			
The program in Food and Agribusiness requires 96 credit points from this table including: (i) 6 credit points of 1000-level program core units (ii) 6 credit points of 2000-level program core units (iii) 24 credit points of 4000-level core units (iv) 6 credit points of 4000-level internship units (v) 6 credit points of 4000-level advanced coursework units (vi) A 48 credit point major in Food Science			
Units of study			
The units of study are listed below.			
1000-level units of study			
Degree core			
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
Program core			
ENVI1003 **Global Challenges: Food, Water, Climate**	6		Semester 2
2000-level units of study			
Degree core			
ENVX2001 **Applied Statistical Methods**	6	**P** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
Program core			
ITLS2000 **Managing Food and Beverage Supply Chains**	6	**N** AGEN2003 or AGEN1005	Semester 2
4000-level units of study			
Core			
AFNR4101 **Research Project A**	12	**P** 144 credit points of level 1000-3000 units of study	Semester 1
AFNR4102 **Research Project B**	12	**P** AFNR4101	Semester 2
Internship units			
FOOD4XX1 to be developed for offering in 2020.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Advanced coursework units			
FOOD4XX2 to be developed for offering in 2020.			

Food and Agribusiness

FOOD AND AGRIBUSINESS

Food and Agribusiness stream

The Food and Agribusiness stream is 156 credit points, consisting of:(i) 6 credit points of 1000-level degree core units(ii) 6 credit points of 2000-level degree core units(iii) A 96 credit point program in Food and Agribusiness(iv) A major from Table S in one of the following: Economics, Economic Policy, Agricultural and Resource Economics, Financial Economics, Econometrics, Accounting, Banking, Business Analytics, Business Information Systems, Business Law, Finance, Industrial Relations and Human Resource Management, International Business, Management or Marketing

Food and Agribusiness program

This program is only available to students enrolled in Food and Agribusiness stream.The program in Food and Agribusiness requires 96 credit points from this table including: (i) 6 credit points of 1000-level program core units (ii) 6 credit points of 2000-level program core units(iii) 24 credit points of 4000-level core units(iv) 6 credit points of 4000-level internship units(v) 6 credit points of 4000-level advanced coursework units(vi) A 48 credit point major in Food Science

Units of study

The units of study are listed below.

1000-level units of study

Degree core

ENVX1002
Introduction to Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Thomas Bishop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour tutorial per week, one 2-hour computer practical per week **Prohibitions:** ENVX1001 **Assessment:** One exam during the exam period (50%), three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This is an introductory statistics unit for students in the agricultural, life and environmental sciences. It provides the foundation for statistics and data science skills that are needed for a career in science and for further study in applied statistics and data science. In the first portion of the unit the emphasis is on describing data using statistical and graphical summaries, and probability models. In the second part the focus is on formal hypothesis testing on experimental data using statistical tests. The final part of the unit is on finding patterns in biological and environmental data, through the use of linear and non-linear functions. In the practicals the emphasis is on applying theory to analysing real datasets using the spreadsheet package Excel and the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

Program core

ENVI1003
Global Challenges: Food, Water, Climate

Credit points: 6 **Teacher/Coordinator:** A/Prof Stephen Cattle **Session:** Semester 2 **Classes:** Two lectures per week, 2hour tutorial/computer lab per week, two-day weekend field trip **Assessment:** One 2-hour exam (50%), field trip report (15%), tutorial presentation (20%), GIS reports (15%) **Practical field work:** Computer practicals and two day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

In the 21st century the population of the world will increase both in size and its expectation in terms of food, energy and consumer demands. Against this demand we have a planet in crisis where natural resources are degraded, biodiversity is diminishing and planetary cycles related to climate are reaching points of irreversible change. Management of our precious natural resources is a balancing act between production and conservation as always, but now we have to do this against a background of potential large scale changes in climate. In this unit students will gain an understanding of the key environmental challenges of the 21st century; namely food security, climate change, water security, biodiversity protection, ecosystems services and soil security. In the second half using Australian case studies we will explore how we manage different agro-ecosystems within their physical constraints around water, climate and soil, while considering linkages with the global environmental challenges. Management now, in the past and the future will be considered, with an emphasis on food production. This unit is recommended unit for students interested in gaining a broad overview of the environmental challenges of the 21st century, both globally and within Australia.

2000-level units of study

Degree core

ENVX2001
Applied Statistical Methods

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 3-hour computer practical per week **Prerequisites:** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] **Assessment:** One exam during the exam period (50%),three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This unit builds on introductory 1st year statistics units and is targeted towards students in the agricultural, life and environmental sciences. It consists of two parts and presents, in an applied manner, the statistical methods that students need to know for further study and their future careers. In the first part the focus is on designed studies including both surveys and formal experimental designs. Students will learn how to analyse and interpret datasets collected from designs from more than than 2 treatment levels, multiple factors and different blocking designs. In the second part the focus is on finding patterns in data. In this part the students will learn to model relationships between response and predictor variables using regression, and find patterns in datasets with many variables using principal components analysis and clustering. This part provides the foundation for the analysis of big data. In the practicals the emphasis is on applying theory to analysing real datasets using the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

Program core

ITLS2000
Managing Food and Beverage Supply Chains

Credit points: 6 **Session:** Semester 2 **Classes:** 1 x 3 hr seminar/tutorial per week **Prohibitions:** AGEN2003 or AGEN1005 **Assessment:** tutorial quiz (10%), individual assignement (35%), group project report (15%), group project presentation (10%), final 2hr exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The food and beverage sector is one of the key economic activities in virtually all countries in the world today. When it comes to logistics and supply chain management within this sector, there is a level of complexity, not frequently found in other industries. This includes the need to consider products bulkiness, perishability and seasonality, coupled with potential additional infrastructure requirements in respect of temperature-controlled storage and transport. As a consequence, there is a higher imperative to have a well-designed end-to-end supply chain. Equally, it is important to understand issues from the perspectives of the various actors in food and beverage supply chains including farms, processing units, wholesalers / distributors, and retailers. Overarching the structuring of any food and beverage supply chain will be consideration of issues such as perishability, quality and risk. Further, for a supply chain to be effective and efficient consideration also needs to be given to the support functions of information management, use of technology, and financial reporting. In today's world, companies compete on supply chains. Those who have the ability to establish a distinctive supply chain and create it as a strategic asset will therefore emerge as industry leaders.

4000-level units of study

Core

AFNR4101
Research Project A

Credit points: 12 **Teacher/Coordinator:** Prof Budiman Minasny **Session:** Semester 1 **Classes:** No formal classes, approximately 18 hours per week **Prerequisites:** 144 credit points of level 1000-3000 units of study **Assessment:** Research proposal, literature review. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to develop a student's ability to undertake a major research project in an area of specialization. The unit builds on theoretical and applied knowledge gained across most of the units of study undertaken throughout their degree program. This unit is a corequisite with AFNR4102 and each student will work with an academic supervisor in an area of specialization and develop a well defined research project to be executed. The research project is undertaken to advance the students ability to build well-developed research skills, a strong analytical capacity, and the ability to provide high quality research results demonstrating a sound grasp of the research question. Working with an academic supervisor students will develop their ability to define a research project including the producing of testable hypotheses, identifying existing knowledge from reviewing the literature and the design and execution of a research strategy towards solving the research question. Students will build on their previous research and inquiry skills through sourcing a wide range of knowledge to solve the research problem and enhance their intellectual and personal autonomy by means of the development of experimental programs. Students will improve their written and planning skills by composing a research project proposal and the writing of a comprehensive literature review.

AFNR4102
Research Project B

Credit points: 12 **Teacher/Coordinator:** Prof Budiman Minasny **Session:** Semester 2 **Classes:** No formal classes, approximately 18 hours per week **Prerequisites:** AFNR4101 **Assessment:** Oral presentation, research paper, poster. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is a continuation of the major research project initiated in AFNR4101 and continues to build on theoretical and applied knowledge gained across most of the units of study undertaken throughout their degree program. Working with their academic supervisor in the area of specialization the student will continue to pursue the defined research project towards presenting final results and conclusions. The research results are presented in a format of a research paper as submitted to a research journal. The research paper and corrected literature review is combined and presented together as a thesis. Students will continue to build their research skills, develop strong analytical capacity, demonstrate a sound grasp of the topic, and an ability to interpret results in a broad framework. Working with an academic supervisor students will develop their ability to produce results of high quality, draw reliable conclusions and identify future areas avenues of research. Students will build on their previous research and inquiry skills through sourcing a wide range of knowledge to solve the research problem and enhance their intellectual and personal autonomy by means of the managing the research program. Students will improve their communication skills through oral presentation of their research findings, the production of a poster detailing their research findings and the writing of a research paper.

Internship units

FOOD4XX1 to be developed for offering in 2020.

Advanced coursework units

FOOD4XX2 to be developed for offering in 2020.

Food Science

About the major

The Food Science major will equip you with knowledge and skills relevant to the food and agribusiness sector, with a focus on the underpinning science of food products and processes. The major will develop analytical, problem-solving and research skills, with food industry as the context. The interdisciplinary and applied nature of the major will also provide you with transferable skills that are complementary with many other fields of study in the life and environmental sciences.

Requirements for completion

A major in Food Science requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)24 credit points of 3000-level core units

A minor in Food Science is available and articulates to this major.

First year

Core: BIOL1XX7 and CHEM1XX1.

The first year of Food Science includes fundamental studies in biology and chemistry.

Second year

Core: AGEN2002 and BCMB2X01 (MEDS2003 for students enrolled in medical science stream).

The second year of Food Science includes studies in food science and in biochemistry and molecular biology, which links food to human health and nutrition.

Third year

Core: AGEN3004, AGCH3025, AGEN3001, AGEN3XXX.

The third year of Food Science includes studies in food processing, food chemistry and biochemistry, food product development, and food quality and safety.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Food Science: completion of 24 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 02 9351 4262

School of Life and Environmental Sciences

Level 5, Carslaw Building F07
University of Sydney NSW 2006

Dr Kim-Yen Phan-Thien
T +61 2 8627 1049
E kim-yen.phan-thien@sydney.edu.au

Learning Outcomes

Students who graduate from Food Science will be able to:

- Demonstrate knowledge of the core sciences in the context of food science.
- Understand how knowledge from food science is integrated and applied in industry practices.
- Demonstrate basic knowledge of agriculture, business and social science as they apply in food and agribusiness value chains.
- Explain the role and relevance of food and agribusiness in society.
- Understand the major biophysical, economic, social and policy drivers that underpin and influence food production, management and business practices.
- Understand how information is adopted and the context within which value chain actors make decisions.
- Identify contemporary issues and opportunities in food and agribusiness.
- Gather, critically evaluate and synthesise information from a range of relevant sources and disciplines.
- Select and apply appropriate and/or theoretical techniques or tools in order to conduct an investigation.
- Collect, accurately record, analyse, interpret and report data.
- Understand methods of effective two-way written and verbal communication with different audiences.
- Communicate with a range of audiences using a variety of modes.
- Be independent and self-directed learners.
- Work effectively, responsibly and safely in an individual and team context.
- Demonstrate knowledge of the regulatory frameworks relevant to food and agribusiness.
- Practise ethical conduct.

Food Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
FOOD SCIENCE			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Food Science major			
A major in Food Science requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 6 credit points of 2000-level food science units (iii) 6 credit points of 2000-level biochemistry units (iv) 24 credit points of 3000-level core units			
Food Science minor			
A minor in Food Science requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 6 credit points of 2000-level food science units (iii) 6 credit points of 2000-level biochemistry units (iv) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
2000-level units of study			
Food science units			
AGEN2002 **Fresh Produce Management**	6	**A** HSC level Mathematics and Biology and CHEM1XX1 or CHEM1XX2 or CHEM1903 or CHEM1904 **P** 6cp from (BIOL1XXX or AGEN1004 or MBLG1XX1)	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Biochemistry units			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream.).			
3000-level units of study			
Major core			
AGEN3004 **Food Processing and Value Adding**	6	**P** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX)	Semester 1
AGCH3025 **Chemistry and Biochemistry of Foods**	6	**A** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **N** AFNR5102 or AGCH3017 or AGCH3024	Semester 1
AGEN3001 **Food Product Development**	6	**A** 6cp from (BIOL1XXX, MBLG1XXX) and 6cp from CHEM1XXX **P** 6cp from AGEN3004	Intensive August
AGEN3XXX to be developed for offering in 2019.			
Minor core			
AGEN3004 **Food Processing and Value Adding**	6	**P** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX)	Semester 1
AGCH3025 **Chemistry and Biochemistry of Foods**	6	**A** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **N** AFNR5102 or AGCH3017 or AGCH3024	Semester 1

Food Science

FOOD SCIENCE

Advanced coursework and projects will be available in 2020 for students who complete this major.

Food Science major

A major in Food Science requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 6 credit points of 2000-level food science units(iii) 6 credit points of 2000-level biochemistry units (iv) 24 credit points of 3000-level core units

Food Science minor

A minor in Food Science requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 6 credit points of 2000-level food science units(iii) 6 credit points of 2000-level biochemistry units(iv) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

2000-level units of study

Food science units

AGEN2002
Fresh Produce Management

Credit points: 6 **Teacher/Coordinator:** Dr Rosalind Deaker **Session:** Semester 1 **Classes:** Two 1-hour lectures per week **Prerequisites:** 6cp from (BIOL1XXX or AGEN1004 or MBLG1XX1) **Assumed knowledge:** HSC level Mathematics and Biology and CHEM1XX1 or CHEM1XX2 or CHEM1903 or CHEM1904 **Assessment:** Three practical reports (15% each), one group presentation (15%), one end of semester exam (40%) **Practical field work:** Two field trips, six practical sessions per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers some fundamental concepts in food science with a particular emphasis on post-harvest management of fresh produce. Students will critically examine the science underpinning management and handling of fresh food products. The unit primarily addresses the challenges of maintaining quality, extending shelf life and improving safety of fresh perishable produce by examining relevant industrial practices and technologies.. Students will develop practical skills and integrate knowledge of physiology, technology and economics of fresh produce management to determine optimal storage and handling conditions for maximum quality, shelf life, safety and ultimately consumer experience. The majority of examples will be drawn from fruits and vegetables, dairy, eggs, meat and seafood products. Industry quality assurance schemes and government regulations will be examined, with particular reference to food safety. The students will gain research, inquiry and communication skills through a research-based group project, an oral presentation and laboratory reports. Personal and intellectual autonomy will be developed through group and individual work.

Textbooks

No prescribed textbooks

Biochemistry units

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901
Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream.).

3000-level units of study

Major core

AGEN3004
Food Processing and Value Adding

Credit points: 6 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien **Session:** Semester 1 **Classes:** Two 1-hour lectures per week **Prerequisites:** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX) **Assessment:** Two individual assignments (10% + 20%), one group processing report (20%), one group oral presentations (10%), one 2-hour final exam (40%) **Practical field work:** One 3-hour practical or excursion per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

From the grinding of grains to the drying of meats, humans have been processing their food since the dawn of civilisation. Over the decades, many traditional processing methods have become industrialised, while new processing technologies have emerged, quietly revolutionising our food systems, diets and cultures. In this unit of study, students examine the biochemical and physicochemical transformations that occur in food materials during processing and how processing parameters affect the fulfilment of food quality, shelf-life, and safety objectives. The unit is roughly organised into modules on (1) processing to modify food structure; (2) processing for preservation; and value-adding, focused on (3) healthier food and (4) fermentation as interesting case studies in food processing.The unit will include lectures, laboratory sessions, group work and visits to food processing facilities.

Textbooks

No prescribed textbooks

AGCH3025
Chemistry and Biochemistry of Foods

Credit points: 6 **Teacher/Coordinator:** Dr Thomas Roberts (Coordinator), Prof Les Copeland **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 4-hour practical fortnightly **Prohibitions:** AFNR5102 or AGCH3017 or AGCH3024 **Assumed knowledge:** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **Assessment:** One 2-hour exam (40%) and six lab reports (6x10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to give students an understanding of the properties of food constituents, and the interactions between these constituents during food processing, storage and digestion. The unit will develop an understanding of the relationship between form and functionality of constituents and the concept of fitness-for-purpose (i.e., quality) in converting agricultural products into foods. Students will gain an appreciation of the relationship between chemical composition and properties of macroconstituents (carbohydrates, proteins, lipids) and microconstituents (vitamins, minerals, antioxidants, flavour and anti-nutritional chemicals) and their functions in plant- and animal-based foods. The material presented in lectures and practical classes will enable students to develop research and inquiry skills and an analytical approach in understanding the biochemistry of foods, food processing and storage. On completing this unit, students will be able to describe the chemical and biochemical properties of major food constituents, and demonstrate an understanding of the functionality of these constituents in food processing and nutrition. Students will have gained experience in laboratory techniques used in industry for the analysis of some food products, and information literacy and communication skills from the preparation of practical reports.

Textbooks

Lecture and laboratory notes will be made available through Blackboard. There is no recommended textbook.

AGEN3001
Food Product Development

Credit points: 6 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien **Session:** Intensive August **Classes:** Intensive Unit - twelve 4-hour workshops over four weeks **Prerequisites:** 6cp from AGEN3004 **Assumed knowledge:** 6cp from (BIOL1XXX, MBLG1XXX) and 6cp from CHEM1XXX **Assessment:** One individual assignment (20%), one group project report (60%), one group presentation (20%) **Practical field work:** Six practical sessions **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this unit of study, students will gain a theoretical and practical understanding of the development of novel food products using traditional and novel food ingredients. Students will examine processes in market trend analysis, product innovation, prototype development, product testing and the formal presentation of a new product. They will develop practical skills in product research and development through a group design project that will require application of product development principles and integration of knowledge regarding product specifications, ingredient interactions and food processing. Product quality, functionality, shelf-life, safety, nutritional and health implications are key considerations in the design process. This is an intensive unit taught as a series of workshops over the first four weeks of semester. It is designed to be taken as one of the final core units in the food science major of the BFoodAgrib as it integrates learnings from across the program and offers a great platform for exploration of product development ideas, that could potentially be expanded in 4th year research projects.

Textbooks

No prescribed textbooks

AGEN3XXX to be developed for offering in 2019.

Minor core

AGEN3004
Food Processing and Value Adding

Credit points: 6 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien **Session:** Semester 1 **Classes:** Two 1-hour lectures per week **Prerequisites:** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX) **Assessment:** Two individual assignments (10% + 20%), one group processing report (20%), one group oral presentations (10%), one 2-hour final exam (40%) **Practical field work:** One 3-hour practical or excursion per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

From the grinding of grains to the drying of meats, humans have been processing their food since the dawn of civilisation. Over the decades, many traditional processing methods have become industrialised, while new processing technologies have emerged, quietly revolutionising our food systems, diets and cultures. In this unit of study, students examine the biochemical and physicochemical transformations that occur in food materials during processing and how processing parameters affect the fulfilment of food quality, shelf-life, and safety objectives. The unit is roughly organised into modules on (1) processing to modify food structure; (2) processing for preservation; and value-adding, focused on (3) healthier food and (4) fermentation as interesting case studies in food processing.The unit will include lectures, laboratory sessions, group work and visits to food processing facilities.

Textbooks

No prescribed textbooks

AGCH3025
Chemistry and Biochemistry of Foods

Credit points: 6 **Teacher/Coordinator:** Dr Thomas Roberts (Coordinator), Prof Les Copeland **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 4-hour practical fortnightly **Prohibitions:** AFNR5102 or AGCH3017 or AGCH3024 **Assumed knowledge:** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **Assessment:** One 2-hour exam (40%) and six lab reports (6x10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to give students an understanding of the properties of food constituents, and the interactions between these constituents during food processing, storage and digestion. The unit will develop an understanding of the relationship between form and functionality of constituents and the concept of fitness-for-purpose (i.e., quality) in converting agricultural products into foods. Students will gain an appreciation of the relationship between chemical composition and properties of macroconstituents (carbohydrates, proteins, lipids) and microconstituents (vitamins, minerals, antioxidants, flavour and anti-nutritional chemicals) and their functions in plant- and animal-based foods. The material presented in lectures and practical classes will enable students to develop research and inquiry skills and an analytical approach in understanding the biochemistry of foods, food processing and storage. On completing this unit, students will be able to describe the chemical and biochemical properties of major food constituents, and demonstrate an understanding of the functionality of these constituents in food processing and nutrition. Students will have gained experience in laboratory techniques used in industry for the analysis of some food products, and information literacy and communication skills from the preparation of practical reports.

Textbooks

Lecture and laboratory notes will be made available through Blackboard. There is no recommended textbook.

Genetics and Genomics

About the major

Genetics and Genomics will provide you with knowledge that can be applied to improving our understanding of evolution (past and present) and of many aspects of the biology of all living organisms.

This knowledge can also be applied to the development of novel biotechnology products, to improving the health of humans and animals, to forensics, to the conservation and management of plants and animals, to the diagnosis and control of pests, parasites and harmful micro-organisms, and to improving the means by which plants and animals can sustain the feeding and clothing of humanity.

Genetics is the science of biological inheritance and variation. Its fundamental principles are embraced by genomics, molecular genetics, 'Mendelian' genetics, epigenetics, cytogenetics, population genetics, and quantitative genetics.

Genomics is a relatively new discipline that has been developed through the need for geneticists and genome scientists to manipulate very large data sets determined by biological inheritance through DNA.

Requirements for completion

A major in Genetics and Genomics requires 48 credit points, consisting of:

(i)12 credit points of 1000-level selective units
(ii)12 credit points of 2000-level selective units
(iii)18 credit points of 3000-level core units
(iv)6 credit points of 3000-level selective units

A minor in Genetics and Genomics is available and articulates to this major.

First year

12 credit points from a selection of: CHEM1XX1, BIOL1XX6, BIOL1XX7, BIOL1XX8 (Medical Science stream students can alternatively complete MEDS1X01).

Second year

12 credit points from a selection of: GEGE2X01, BCMB2X01, QBIO2001. Medical Science stream students select from: GEGE2X01, MEDS2003, QBIO2001. Animal and Veterinary Bioscience stream students select from: GEGE2X01, AVBS2005, QBIO2001.

All students are encouraged to enrol in GEGE2X01.

Third year

BCHM3X92, BIOL3X18, GEGE3X04 and 6 credit points from a selection of QBIO3X01, BIOL3033

Most students with an interest in genetics and genomics will work in a field related to medical genomics or bioinformatics or will be interested to apply their understanding of evolutionary genetics to solving genomics problems in the field of conservation biology. The major structure for genetics and genomics enables students to follow either of these options.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Genetics and Genomics: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9036 5417

Professor Claire Wade
T +61 2 9351 8097
E claire.wade@sydney.edu.au

Example pathways

For a career in Medical Genomics for students from Medical Sciences: First Year: CHEM1XX1, MEDS1X01; Second Year: GEGE2X01, MEDS2003 Third Year: BCHM3X92; BIOL3X18; GEGE3X04; QBIO3X01.

For a career in Bioinformatics for students from Animal and Veterinary Biosciences: First Year: BIOL1XX6, BIOL1XX7; Second Year: GEGE2X01, VETS2005 Third Year: BCHM3X92; BIOL3X18; GEGE3X04; QBIO3X01.

For a career in Wildlife Conservation Genomics for students from Biological Sciences: First Year: CHEM1XX1, BIOL1XX7; Second Year: GEGE2X01, BCMB2001 Third Year: BCHM3X92; BIOL3X18; GEGE3X04; BIOL3033.

For a career in Quantitative Genetics and Animal Breeding for students from Agricultural Science: First Year: CHEM1XX1, BIOL1XX7; Second Year: GEGE2X01, BCMB2001 Third Year: BCHM3X92; BIOL3X18; GEGE3X04; QBIO3X01.

Learning Outcomes

Students who graduate from Genetics and Genomics will be able to:

1. Understand the genetics of populations.
2. Understand genomic structure and organisation of the genome.
3. Understand the relationship between genotype and phenotype for simple and complex traits.
4. Understand the relationship between DNA sequence, RNA transcription and translation of proteins.
5. Use skills in management and analysis of genomic data.
6. Understand the application of genomic biotechnologies.
7. Map genes associated with complex and simply inherited phenotypes.

Genetics and Genomics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
GENETICS AND GENOMICS			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Genetics and Genomics major			
A major in Genetics and Genomics requires 48 credit points from this table including: (i) 12 credit points of 1000-level selective units (ii) 12 credit points of 2000-level selective units (iii) 18 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units			
Genetics and Genomics minor			
A minor in Genetics and Genomics requires 36 credit points from this table including: (i) 12 credit points of 1000-level selective units (ii) 12 credit points of 2000-level selective units (iii) 12 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Selective			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			
2000-level units of study			
Selective			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
QBIO2001 **Molecular Systems Biology**	6	**A** Metabolism, protein synthesis, gene regulation, quantitative and statistical skills	Semester 2
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
MEDS2003 and AVBS2005 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Major core			
BCHM3092 **Proteomics and Functional Genomics**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3992 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3992 **Proteomics and Functional Genomics (Adv)**	6	**P** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3092 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1
BIOL3918 **Gene Technology and Genomics (Adv)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **N** BIOL3018	Semester 1
GEGE3X04 to be developed for offering in 2019.			
Major selective			
BIOL3033 and QBIO3X01 to be developed for offering in 2019.			
Minor selective			
BCHM3092 **Proteomics and Functional Genomics**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3992 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3992 **Proteomics and Functional Genomics (Adv)**	6	**P** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3092 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1
BIOL3918 **Gene Technology and Genomics (Adv)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **N** BIOL3018	Semester 1
GEGE3X04 to be developed for offering in 2019.			

Genetics and Genomics

GENETICS AND GENOMICS

Advanced coursework and projects will be available in 2020 for students who complete this major.

Genetics and Genomics major

A major in Genetics and Genomics requires 48 credit points from this table including:(i) 12 credit points of 1000-level selective units(ii) 12 credit points of 2000-level selective units (iii) 18 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units

Genetics and Genomics minor

A minor in Genetics and Genomics requires 36 credit points from this table including:(i) 12 credit points of 1000-level selective units(ii) 12 credit points of 2000-level selective units (iii) 12 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Selective

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating

genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks

Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks

Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks

Please see unit outline on LMS

Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks

TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease?

Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks
TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Selective

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901
Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

QBIO2001
Molecular Systems Biology

Credit points: 6 **Teacher/Coordinator:** Prof David James (Coordinator), Dr Mark Larance **Session:** Semester 2 **Classes:** Two 1-hour lectures; one 3-hour practical session on a weekly basis **Assumed knowledge:** Metabolism, protein synthesis, gene regulation, quantitative and statistical skills **Assessment:** One 3-hour final exam (50%), three 45-minute quizzes (20%), one 5-minute presentation (10%), laboratory assessment and practical book (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Experimental approaches to the study of biological systems are shifting from hypothesis driven to hypothesis generating research. Large scale experiments at the molecular scale are producing enormous quantities of data ("Big Data") that need to be analysed to derive significant biological meaning. For example, monitoring the abundance of tens of thousands of proteins simultaneously promises ground-breaking discoveries. In this unit, you will develop specific analytical skills required to work with data obtained in the biological and medical sciences. The unit covers quantitative analysis of biological systems at the molecular scale including modelling and visualizing patterns using differential equations, experimental design and data types to understand disease aetiology. You will also use methods to model cellular systems including metabolism, gene regulation and signalling. The practical program will enable you to generate data analysis workflows, and gain a deep understanding of the statistical, informatics and modelling tools currently being used in the field. To leverage multiple types of expertise, the computer lab-based practical component of this unit will be predominantly a team-based collaborative learning environment. Upon completion of this unit, you will have gained skills to find meaningful solutions to difficult biological and disease-related problems with the potential to change our lives.

Textbooks

An Introduction to Systems Biology: Design Principles of Biological Circuits, Uri Alon, (Chapman and Hall/CRC, 2007). Systems Biology, Edda Klipp, Wolfram Liebermeister, Christoph Wierling, Axel Kowald, Hans Lehrach, and Ralf Herwig, (Wiley-Blackhall, 2009). Molecular biology of the cell, Alberts B et al (6th edition, Garland Science, 2015) Discovering Statistics Using R, Andy Field (2012, SAGE Publications Ltd). Computational and Statistical Methods for Protein Quantitation by Mass Spectrometry, Martens L et al (Wiley, 2013)

GEGE2001
Genetics and Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prohibitions:** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution.

GEGE2901
Genetics and Genomics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution. The Advanced mode of Genetics and Genomics will provide you with challenge and a higher level of academic rigour. You will have the opportunity to plan and carry out a project that will develop your skills in contemporary genetics/molecular biology techniques and will provide you with a greater depth of disciplinary understanding. The Advanced mode will culminate in a written report and in an oral presentation where you will discuss a recent breakthrough that has been enabled by the use of modern genetics and genomics technologies. This is a unit for anyone wanting to better understand the how genetics has shaped the earth and how it will shape the future.

Textbooks
TBA

MEDS2003 and AVBS2005 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Major core

BCHM3092
Proteomics and Functional Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Stuart Cordwell, Jill Johnston **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and one 3-hour practical per week. **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3992 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will focus on the high throughput methods for the analysis of gene structure and function (genomics) and the analysis of proteins (proteomics), which are at the forefront of discovery in the biomedical sciences. The course will concentrate on the hierarchy of gene-protein-structure-function through an examination of modern technologies built on the concepts of genomics versus molecular biology, and proteomics versus biochemistry. Technologies to be examined include DNA sequencing, nucleic acid and protein microarrays, two-dimensional gel electrophoresis of proteins, uses of mass spectrometry for high throughput protein identification, isotope tagging for quantitative proteomics, high-performance liquid chromatography, high-throughput functional assays, affinity chromatography and modern methods for database analysis. Particular emphasis will be placed on how these technologies can provide insight into the molecular basis of changes in cellular function under both physiological and pathological conditions as well as how they can be applied to biotechnology for the discovery of biomarkers, diagnostics, and therapeutics. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in proteomics and genomics.

BCHM3992
Proteomics and Functional Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Stuart Cordwell, Jill Johnston **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and one 3-hour practical per fortnight. **Prerequisites:** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3092 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will focus on the high throughput methods for the analysis of gene structure and function (genomics) and the analysis of proteins (proteomics) which are at the forefront of discovery in the biomedical sciences. The course will concentrate on the hierarchy of gene-protein-structure-function through an examination of modern technologies built on the concepts of genomics versus molecular biology, and proteomics versus biochemistry. Technologies to be examined include DNA sequencing, nucleic acid and protein microarrays, two-dimensional gel electrophoresis of proteins, uses of mass spectrometry for high throughput protein identification, isotope tagging for quantitative proteomics, high-performance liquid chromatography, high-throughput functional assays, affinity chromatography and modern methods for database analysis. Particular emphasis will be placed on how these technologies can provide insight into the molecular basis of changes in cellular function under both physiological and pathological conditions as well as how they can be applied to biotechnology for the discovery of biomarkers, diagnostics, and therapeutics. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in proteomics and genomics.

The lecture component of this unit of study is the same as BCHM3092. Qualified students will attend seminars/practical classes in which more sophisticated topics in proteomics and genomics will be covered.

BIOL3018
Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

BIOL3918
Gene Technology and Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **Prohibitions:** BIOL3018 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of BIOL3018 Gene Technology and Genomics. The content and nature of these components may vary from year to year.

GEGE3X04 to be developed for offering in 2019.

Major selective

BIOL3033 and QBIO3X01 to be developed for offering in 2019.

Minor selective

BCHM3092
Proteomics and Functional Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Stuart Cordwell, Jill Johnston **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and one 3-hour practical per week. **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3992 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will focus on the high throughput methods for the analysis of gene structure and function (genomics) and the analysis of proteins (proteomics), which are at the forefront of discovery in the biomedical sciences. The course will concentrate on the hierarchy of gene-protein-structure-function through an examination of modern technologies built on the concepts of genomics versus molecular biology, and proteomics versus biochemistry. Technologies to be examined include DNA sequencing, nucleic acid and protein microarrays, two-dimensional gel electrophoresis of proteins, uses of mass spectrometry for high throughput protein identification, isotope tagging for quantitative proteomics, high-performance liquid chromatography, high-throughput functional assays, affinity chromatography and modern methods for database analysis. Particular emphasis will be placed on how these technologies can provide insight into the molecular basis of changes in cellular function under both physiological and pathological conditions as well as how they can be applied to biotechnology for the discovery of biomarkers, diagnostics, and therapeutics. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in proteomics and genomics.

BCHM3992
Proteomics and Functional Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Stuart Cordwell, Jill Johnston **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and one 3-hour practical per fortnight. **Prerequisites:** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3092 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will focus on the high throughput methods for the analysis of gene structure and function (genomics) and the analysis of proteins (proteomics) which are at the forefront of discovery in the biomedical sciences. The course will concentrate on the hierarchy of gene-protein-structure-function through an examination of modern technologies built on the concepts of genomics versus molecular biology, and proteomics versus biochemistry. Technologies to be examined include DNA sequencing, nucleic acid and protein microarrays, two-dimensional gel electrophoresis of proteins, uses of mass spectrometry for high throughput protein identification, isotope tagging for quantitative proteomics, high-performance liquid chromatography, high-throughput functional assays, affinity chromatography and modern methods for database analysis. Particular emphasis will be placed on how these technologies can provide insight into the molecular basis of changes in cellular function under both physiological and pathological conditions as well as how they can be applied to biotechnology for the discovery of biomarkers, diagnostics, and therapeutics. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in proteomics and genomics.

The lecture component of this unit of study is the same as BCHM3092. Qualified students will attend seminars/practical classes in which more sophisticated topics in proteomics and genomics will be covered.

BIOL3018
Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

BIOL3918
Gene Technology and Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **Prohibitions:** BIOL3018 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of BIOL3018 Gene Technology and Genomics. The content and nature of these components may vary from year to year.

GEGE3X04 to be developed for offering in 2019.

Geography

Study in the discipline of Geography is offered by the School of Geosciences in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

Geography is the study of earth as the home of people. As the need to find solutions to issues of environmental degradation and sustainability, population change and globalisation have become more challenging, the skills and knowledge of geographers have come to the forefront.

Through a geography major, you will study the interactions between earth, environment and society. This involves consideration of such issues as climate change, population growth, hazards and environmental management. You will have the opportunity to go on field trips to overseas locations and to rural and urban parts of Australia, and participate in tutorial debates about such issues as global inequality and poverty. You will also engage in computer-based analysis of geographic data, and on-line discussion boards and interactive education techniques.

Requirements for completion

A major in Geography requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)6 credit points of 2000-level core units
(iii)6 credit points of 2000-level selective units
(iv)12 credit points of 3000-level core units
(v)6 credit points of 3000-level set 1 units
(vi)6 credit points of 3000-level set 2 units

A minor in Geography is available and articulates to this major.

First year

GEOS1X01 and GEOS1X02 provide an introduction to the study of Geography, and to the social and biophysical phenomena that are the objects of geographical inquiry. These units provide an introduction to the conceptual frameworks within which contemporary geographers work, and provide a platform for specialisation within the discipline in later years.

Second year

GEOS2X21 provides all students in the Geography major and minor with the essential concepts that frame interactions between humans and other components of the earth system. In addition, students may choose from a range of units that support specialisation in human geography (GEOS2X23) or physical geography (GEOS2X16, GEOS2X11, GEOS2X15).

Third year

The third year in the Geography major and minor provides you with training in methods and practice of contemporary geographical inquiry, and explores in detail the concepts that frame them. In addition to the core units (GEOS3X33 and GEOS3X19), selective units in human (GEOS3X30, GEOS3X24, GEOS3X53) and physical geography (GEOS3X09, GEOS3X14, GEOS3X03) allow you to complete your specialisation within Geography.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours

Requirements for Honours in the area of Geography: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/science/geosciences/undergrad/ug_geog.shtml
E allyson.montenegro@sydney.edu.au
T +61 2 9351 2912

School of Geosciences
Room 348, Madsen Building F09
University of Sydney NSW 2006

Dr Daniel Penny
T +61 2 9351 6464
E dan.penny@sydney.edu.au

Example pathways

Human Geography Pathway (major)
GEOS1X01, GEOS1X02
GEOS2X23, GEOS2X21
GEOS3X19, GEOS3X33, GEOS3X20 and/or GEOS3X24, and GEOS3X53

Physical Geography Pathway (major)
GEOS1X01, GEOS1X02
GEOS2X11 and/or GEOS2115, GEOS2X21 and GEOS2X16
GEOS3X19, GEOS3X33, GEOS3X09 and/or GEOS3X14 and/or GEOS3X03

Learning Outcomes

Students who graduate from Geography will be able to:

1. Demonstrate a coherent geographical understanding of trends, processes and impacts that shape Australian and other environments and/or societies at different spatial and temporal scales
2. Recognise the deeply co-constitutive nature of social and biophysical phenomena
3. Demonstrate an awareness of the importance of multi- and trans-disciplinarity in the study of contemporary environmental and social issues
4. Demonstrate an understanding of Geography as an academic discipline, including awareness of its concepts, history, and principal subfields, whilst acknowledging the contested, provisional and situated nature of geographical understanding
5. Use various tools to interpret, generate and analyse quantitative (particularly spatial) and qualitative data, with specific competencies in Geographical Information Systems
6. Apply geographical thought creatively, critically and appropriately to specific spaces, places and/or environments
7. Recognise, evaluate and synthesise various views, arguments and sources of knowledge pertinent to solving environmental and social problems
8. Resolve geographical questions by ethical means, applying evidence-based knowledge and appropriate research techniques, including those associated with field work
9. Communicate geographical perspectives and knowledge effectively to specialist and non-specialist audiences using appropriately selected written, oral and visual means
10. Contribute effectively as a member or leader of diverse teams working in geographical or multidisciplinary contexts
11. Reflect on and direct their intellectual and professional development as geographers.

Geography

GEOGRAPHY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Geography major

A major in Geography requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 6 credit points of 2000-level core units (iii) 6 credit points of 2000-level selective units(iv) 12 credit points of 3000-level core units(v) 6 credit points of 3000-level set 1 units(vi) 6 credit points of 3000-level set 2 units

Geography minor

A minor in Geography requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 6 credit points of 2000-level core units (iii) 6 credit points of 2000-level selective units (iv) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

GEOS1001
Earth, Environment and Society

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the gateway unit of study for Human Geography, Physical Geography, Environmental Studies and Geology. Its objective is to introduce the big questions relating to the origins and current state of the planet: climate change, environment, landscape formation, and the growth of the human population. During the semester you will be introduced to knowledge, theories and debates about how the world's physical and human systems operate. The first module investigates the evolution of the planet through geological time, with a focus on major Earth systems such as plate tectonics and mantle convection and their interaction with the atmosphere, hydrosphere, biosphere and human civilisations. The second module presents Earth as an evolving and dynamic planet, investigating global environmental change, addressing climate variability and human impacts on the natural environment and the rate at which these changes occur and how they have the potential to dramatically affect the way we live. Finally, the third module, focuses on human-induced challenges to Earth's future. This part of the unit critically analyses the relationships between people and their environments, with central consideration to debates on population change, resource use and the policy contexts of climate change mitigation and adaptation.

GEOS1002
Introductory Geography

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson, Dr Dan Penny **Session:** Semester 2 **Classes:** One 2 hour lecture per week and eight 2 hour practicals during semester. **Prohibitions:** GEOS1902 or GEOG1001 or GEOG1002 **Assessment:** One 2 hour exam, one 2000 word essay, two online quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a geographical perspective on the ways in which people interact with each other and the physical world, focussing on the processes that generate spatial variation and difference. Students will consider the development and characteristics of natural environments across the globe, and will explore how these environments both constrain, and are influenced by, humans. In the process, they will learn about the biophysical, political, economic, cultural and urban geographies that shape contemporary global society. Each of these themes will be discussed with reference to key examples, in order to understand the ways in which the various processes (both physical and human) interact. The unit of study is designed to attract and interest students who wish to pursue geography as a major within their undergraduate degree, but also has relevance to students who wish to learn how to think geographically about the contemporary world.

GEOS1901
Earth, Environment and Society Advanced

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1001, but will be required to carry out more challenging practical assignments.

GEOS1902
Introductory Geography (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson, Dr Dan Penny **Session:** Semester 2 **Classes:** One 2 hour lecture per week and 8 2 hour practicals per semester, plus independent group work. **Prohibitions:** GEOS1002 or GEOG1001 or GEOG1002 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** One 2 hour exam, one 1000 word essay, two online quizzes, one practical report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1002, but will be required to carry out more challenging practical assignments.

2000-level units of study

Core

GEOS2121
Environmental and Resource Management

Credit points: 6 **Teacher/Coordinator:** Dr Sophie Webber **Session:** Semester 2 **Classes:** Two hour lecture; one hour tutorial per week **Prerequisites:** 6 credit points of first year Geosciences units or ECOP1001 or ECOP1002 **Prohibitions:** GEOS2921 **Assessment:** One exam, one essay, one report, tutorial attendance (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are in the midst of an unprecedented global ecological and climatological crisis, and consequently need to transform our social, political and economic systems. This crisis Â¿ its causes, its effects, and its solutions Â¿ are geographically unevenly distributed and situated. Therefore, this unit of study uses geographical concepts to consider what has caused this global crisis, how we should think about the relations and interactions between humans and their environments, and what some strategies are for managing our environment and resources to negotiate this predicament. Using examples focused in Australia, Asia, and the Pacific region, students will learn how to integrate environmental, economic, political, social and cultural considerations and perspectives, and how to evaluate environmental and resource management policies and ideas.

GEOS2921
Environmental and Resource Management (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Sophie Webber **Session:** Semester 2 **Classes:** Two hour lecture; one hour tutorial per week **Prerequisites:** A mark of 75 in a 6 credit point Junior Geosciences unit of study or a mark of 75 in ECOP1001 or ECOP1002 **Prohibitions:** GEOS2121 **Assessment:** One exam, one essay, one report, tutorial attendance (100%) **Practical field work:** Seminar, maximum of four hours **Mode of delivery:** Normal (lecture/lab/tutorial) day

Advanced students will receive the same core lecture materials as for GEOS2121 but have a separate seminar and are required to complete alternative written work.

Selective

GEOS2116
Earth Surface Processes

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x3-hr practical (lab/computer) sessions each week **Prohibitions:** GEOS2916 or GEOG2321 **Assessment:** practical and field assignments, final exam **Practical field work:** 3-5 day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

The surface of the planet on which you live is the product of a balance between tectonic forces and numerous agents of erosion. The landscapes in which you live and work, and from which you draw resources, are therefore the legacy of many processes operating synchronously over long time periods. It is also true that Earth's landscapes are dynamic, and constantly changing around you in response to climate, tectonics and patterns of life. The sustainable management of landscapes is strongly dependent upon an awareness of those processes and the ways that they constrain human-environment interactions. In Earth Surface Processes, you will learn how landscapes are produced, and what this means for contemporary land use. Lectures by experts in physical geography, geology, soil science and environmental science will introduce you to the planetary and regional-scale controls on landforms and landscape dynamics, and the nature and distribution of major Australian landscape types. Focussed around 'hands on' field and laboratory-based tasks, students will gain essential practical, analytical and interpretive skills in the analysis of landscapes and earth surface processes that shape them. This is a unit for anyone wanting to better understand the planet on which they live.

Textbooks

Allen, P.A., 2009. Earth surface processes. John Wiley and Sons. Scitech, 551.3 72 Sharma, V.K., 2010. Introduction to process geomorphology. CRC Press. Scitech, 551.41 113

GEOS2916
Earth Surface Processes (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x3-hr practical (lab/computer) sessions each week **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GEOS2116 or GEOG2321 **Assessment:** practical and research assignments, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The surface of the planet on which you live is the product of a balance between tectonic forces and numerous agents of erosion. The landscapes in which you live and work, and from which you draw resources, are therefore the legacy of many processes operating synchronously over long time periods. It is also true that Earth's landscapes are dynamic, and constantly changing around you in response to climate, tectonics and patterns of life. The sustainable management of landscapes is strongly dependent upon an awareness of those processes and the ways that they constrain human-environment interactions. In the Advanced mode of Earth Surface Processes, you will learn how landscapes are produced, and what this means for contemporary land use. Lectures by experts in physical geography, geology, soil science and environmental science will introduce you to the planetary and regional-scale controls on landforms and landscape dynamics, and the nature and distribution of major Australian landscape types. Focussed around 'hands on' field and laboratory-based tasks, students will gain essential practical, analytical and interpretive skills in the analysis of landscapes and earth surface processes that shape them. The Advanced mode of Earth Surface Processes challenges you to create new knowledge, and provides a higher level of academic rigour. You will take part in a series of small-group practical exercises that will develop your skills in research design and execution, and will provide you with a greater depth of understanding in core aspects of geomorphology. The Advanced mode will culminate in a research-focussed Advanced Assignment. This is a unit for anyone wanting to better understand the planet on which they live, and who may wish to develop higher-level analytical and research skills in geomorphology and landscape analysis.

Textbooks

Allen, P.A., 2009. Earth surface processes. John Wiley and Sons. Scitech, 551.3 72 Sharma, V.K., 2010. Introduction to process geomorphology. CRC Press. Scitech, 551.41 113

GEOS2111
Natural Hazards: a GIS Approach

Credit points: 6 **Teacher/Coordinator:** A/Prof Dale Dominey-Howes **Session:** Semester 1 **Classes:** Two hour lecture; two hour practical/tute/lab **Prerequisites:** 6 credit points of Junior Geosciences units **Prohibitions:** GEOS2911 **Assessment:** One 2 hour exam, three reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.

The unit provides an essential framework for understanding the environmental response to short- and long-term geologic, oceanic and atmospheric processes. This Unit of Study introduces students to a variety of natural phenomena that affect society with impact levels ranging from nuisance to disastrous. The discussion of each hazard focuses on: (1) the process mechanics, (2) hazards and risk, and (3) methods for mitigation. Geographic Information Systems (GIS) are used by scientists, planners, policy-makers and the insurance industry alike to address many issues relating to natural hazards. This Unit of Study will introduce students to the major concepts relating to GIS and provide practical experience in the application of GIS techniques to hazard mapping, risk assessment and mitigation.

Textbooks

No prescribed textbook

GEOS2115
Oceans, Coasts and Climate Change

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Müller, A/Prof Jody Webster, A.Prof Ana Vila-Concejo **Session:** Intensive July, Semester 1 **Classes:** Twenty-five 1 hour lectures, three 1 hour workshops, eight 2 hour practical classes. **Prerequisites:** 24 credit points from Junior Units of Study **Prohibitions:** GEOS2915 or MARS2006 **Assumed knowledge:** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **Assessment:** Lab reports (60%), one 2-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces core concepts about how the formation of ocean basins and their influence on climate govern the development of coasts and continental margins. These concepts provide a framework for understanding the geographic variation of coasts, continental shelves and sediment accumulations in the deep ocean. Ocean-basin evolution is explained in terms of movements within the Earth's interior and how these movements determine the geometry of ocean basins, and their alpine counterparts, which interact with the global circulation of the ocean and atmosphere. This interaction plays a key role in marine sedimentation and controls the environmental conditions responsible for the development of coral reefs and other ecosystems. The Unit of Study systematically outlines how these factors have played out to produce, by gradual change, the coasts we see today, as well as the less familiar deposits hidden beneath the sea and coastal lands. The Unit thereby outlines how knowledge of responses to climate change in the past allow us to predict environmental responses to accelerated climate change occurring now and in the future due to the industrial greenhouse effect, but places these responses into perspective against the geological record. Overall therefore, the Unit aims to provide familiarity with fundamental phenomena central to the study of marine geoscience and environmental impacts, introduced through process-oriented explanations. The Unit of Study is structured around GIS-based practical sessions and problem-based project work, for which lectures provide the theoretical background.

Textbooks

On line reading material provided via Fisher Library

GEOS2123

The Geography of Cities and Regions

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** One hour tutorial per week **Prerequisites:** 6 credit points of first year Geosciences units. **Prohibitions:** GEOS2923 **Assessment:** Written reports (20%), exam (40%), field report (20%), GIS project (20%) **Practical field work:** Two hours on average, including fieldtrips within Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

How can we understand the ways that cities and regions change over time, and how these processes shape people's lives? This Unit of Study provides conceptual and practical material for exploring these questions. A program of lectures and tutorials in complemented by close study of Sydney, using GIS (census and satellite imagery) and a series of walking tours to different parts of the city. Assessment is tailored to projects in which students are required to integrate conceptual ideas about cities and regions with GIS mapping and field observations.

GEOS2911

Natural Hazards: A GIS Approach (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dale Dominey-Howes **Session:** Semester 1 **Classes:** Two hour lecture; two hour practical/tute/lab **Prerequisites:** A mark of 75 in a 6 credit point Junior Geosciences unit of study **Prohibitions:** GEOS2111 **Assessment:** One 2 hour exam, three reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.

This unit has the same objectives as GEOS2111 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives.

Textbooks

No set textbook

GEOS2915

Oceans, Coasts and Climate Change (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Muller **Session:** Semester 1 **Classes:** Twenty-five 1 hour lectures, three 1 hour workshops, eight 2 hour practical classes. **Prerequisites:** Distinction average in 48 credit points from Junior units of study. **Prohibitions:** GEOS2115 or MARS2006 **Assumed knowledge:** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **Assessment:** Lab reports (60%), one 2 hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as GEOS2115 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives.

Textbooks

Online reading materials are provided via Fisher Library.

GEOS2923

The Geography of Cities and Regions (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** Two hour lecture; one hour tutorial per week **Prerequisites:** A mark of 75 or above in 6 credit points of first year Geosciences units. **Prohibitions:** GEOS2123 **Assessment:** Written reports (20%), exam (40%), field report (20%), GIS project (20%) **Practical field work:** Two hours on average, including fieldtrips within Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS2923 has the same thematic content as GEOS2123 however with elements taught at an Advanced level.

3000-level units of study

Core

GEOS3333

Geographical Concepts, Skills and Methods

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard **Session:** Semester 2 **Classes:** 2 hour lecture, 1 hour tutorials per week **Prerequisites:** 24 credit points of Intermediate units of study, including 6 credit points from following (GEOS2112 or GEOS2912 or GEOS2123 or GEOS2923 or GEOS2115 or GEOS2915 or GEOS2121 or GEOS2921 or SOIL2002 or LWSC2002) **Prohibitions:** GEOS3933 **Assumed knowledge:** Basic knowledge of ARC GIS software. **Assessment:** Two 1 hr in-class exams (50%), active participation in fieldwork and classes (25%), one 2000w fieldwork report (25%) **Practical field work:** Approximately 13 hours of fieldwork per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS3333 is designed to be the 'capstone' for a Major in Geography. Its aim is to bring together the core concepts within the discipline; connect these to methodological practices, and further develop the field-based skills associated with geographical research. Reflecting the straddle of the discipline across the natural and social sciences, this unit draws on a wide diversity of material to impart key insights about the essential qualities of 'doing Geography'. This includes (i) a weekly lecture program which addresses three thematic concerns of Geography (human-environment interactions; spatial relations; and politics, policy and practice) using examples from the natural and social science perspectives at global, national and local scales; (ii) a two-hour prac class each week which introduces key methods (relevant to both the natural and social science parts of the discipline) and which leads to a major research proposal exercise; and (iii) 24 hours fieldwork through the semester, which can take the form either of a three-day field trip to rural NSW or three separate day-trips within Sydney. GEOS3333 is one of two compulsory units for the Geography Major (the other is GEOS3053) and is highly recommended for students contemplating Honours in Geography.

GEOS3933

Geog. Concepts, Skills and Methods (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard **Session:** Semester 2 **Classes:** 1 lecture, 2 tutorials per week **Prerequisites:** Distinction average in 24 credit points of Intermediate units of study including 6 credit points from one of the following units: GEOS2112, GEOS2912, GEOS2123, GEOS2923, GEOS2115, GEOS2915, GEOS2121, GEOS2921, SOIL2002, LWSC2002. **Prohibitions:** GEOS3333 **Assumed knowledge:** Basic knowledge of ARC GIS software. **Assessment:** One 2hr exam, one practical report, one 2000w fieldwork report (100%) **Practical field work:** 24 hours of fieldwork per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS3933 has the same thematic content as GEOS3333 however with elements taught at an Advanced level.

GEOS3X19 to be developed for offering in 2019.

Set 1 units

GEOS3009

Coastal Environments and Processes

Credit points: 6 **Teacher/Coordinator:** A/Prof Jody Webster, A/Prof Ana Vila-Concejo, Dr Tristan Salles **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week; weekend excursion. **Prerequisites:** (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics or Mathematics or Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **Prohibitions:** GEOS3909 or MARS3003 or MARS3105 **Assessment:** One 2 hour exam, research reports and an online quiz (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this course is to introduce students to a variety of Coastal Environments and the major processes which control the morphodynamic evolution of these systems. The course offers a unique opportunity of learning the full spectrum of marine sedimentary environments from siliciclastic, temperate, highly urbanised and impacted estuarine ecosytems to carbonate, tropical, pristine and undeveloped/protected coastal and continental margin environments. The course is divided in three sections: Section A covers the basic morphodynamics and processes impacting carbonate-dominated coastal and continental margin environments. The focus is on carbonate reefal and margin systems and their geologic and biologic responses to past, present and future environmental changes; Section B covers the basic morphodynamics of temperate and tropical coasts, including beach morphodynamics and basic knowledge on waves and currents; Section C consolidates all concepts learnt in the previous sections by applying them to numerical modelling.

There is a compulsory weekend fieldtrip to the NSW coast to study beach morphodynamics and fieldwork techniques. Depending on the year, there may be a voluntary fieldtrip to a coral reef environment, for example, The University of Sydney One Tree Island Research Station.

Textbooks

List of selected readings provided online.

GEOS3909
Coastal Environments and Processes (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Jody Webster **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week; weekend excursion **Prerequisites:** Distinction average in (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics, Mathematics, Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **Prohibitions:** GEOS3009 or MARS3003 or MARS3105 **Assessment:** One 2 hour exam, research reports and an online quiz (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A distinction average in prior Geography or Geology units is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3009 but will carry out more challenging projects, practicals, assignments and tutorials.

GEOS3520
Urban Citizenship and Sustainability

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** 2 hour lecture and 1 hour tutorial per week, six 2 hours practical sessions. **Prerequisites:** 24 credit points of Intermediate units of study, including 6 credit points from the following (GEOS2112 or GEOS2912 or GEOS2123 or GEOS2923 or GEOS2115 or GEOS2915 or GEOS2121 or GEOS2921 or SOILS2002 or LWSC2002) **Prohibitions:** GEOS3920 **Assessment:** One 2hr exam, one 2000w essay, one 2000w group-based prac report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cities are now the predominant home for humanity. More than half of the world's population reside in cities. The contemporary growth of cities, however, is attached to profound political questions about what it means to be urban, and what 'being urban' means for the planet. This Unit of Study provides grounding to these crucial questions. In the first half of the semester, lectures address the question: are cities sustainable? Why or why not? And for whom? This focus addresses utopian visions for cities, urban history, ecological footprint analysis, bioregionalism, transport options, urban form and urban policy, with reference to sustainable futures and the role of custodianship. During the second half of the semester, lectures address the question: what does it mean to be a 'citizen', and what has this got to do with cities and different approaches to urban sustainability? This includes consideration of historical and contemporary configurations of citizenship. Case studies illustrate ways in which new forms of citizenship are produced through struggles over rights to the city and the urban environment. Through the semester a practicals program enables students to develop urban-based research projects.

GEOS3920
Urban Citizenship and Sustainability (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** 2 hour lecture and 2 hour tutorial per week **Prerequisites:** Distinction average in 24 credit points of Intermediate units of study including 6 credit points from one of the following units: GEOS2112, GEOS2912, GEOS2123, GEOS2923, GEOS2115, GEOS2915, GEOS2121, GEOS2921, SOIL2002, LWSC2002 **Prohibitions:** GEOS3520 **Assessment:** One 2hr exam, one 2000w essay, one 2000w group-based prac report. **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS3920 has the same thematic content as GEOS3520 however with elements taught at an Advanced level

GEOS3524
Global Development and Livelihoods

Credit points: 6 **Teacher/Coordinator:** Dr Jeff Neilson **Session:** Semester 1 **Classes:** 2 lectures, 1 tutorial per week **Prerequisites:** 24 credit points of Intermediate units of study including 6 credit points of Intermediate Geoscience **Prohibitions:** GEOS3924 or GEOS2112 or GEOS2912 **Assessment:** Two 1hr exams, one 2000w essay, Tutorial participation, Discussion papers (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides students with grounding in core theories and frameworks used in Geography to account for the social, spatial and economic unevenness in global development. During the first half of the semester, we focus on questions relating to who are the winners and losers from contemporary patterns of global economic change. This includes the analysis of relevant conceptual approaches to understand processes of global development and inequality (including comparative advantage, global value chain theory, developmentalism, structuralism, neo-liberalism, and post-development). Then, in the second half of the semester, we adopt a livelihoods approach to better understand these broader processes from the perspective of individuals, households and communities. In general, issues are tailored to themes being played out in Asia-Pacific countries. Students are expected to participate in a variety of practical class exercises throughout the semester. This unit provides a feeder-unit into the Southeast Asia Field School.

GEOS3924
Global Development and Livelihoods (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Jeff Neilson **Session:** Semester 1 **Classes:** 2 lectures, 1 tutorial per week **Prerequisites:** 24 credit points of Intermediate units of study, including a distinction in 6 credit points of Intermediate Geoscience **Prohibitions:** GEOS3524 or GEOS2112 or GEOS2912 **Assessment:** Two 1hr exams, one 2000w essay, Tutorial participation, Discussion papers (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS3924 has the same thematic content as GEOS3524 however with elements taught at an Advanced level.

Set 2 units

GEOS3014
GIS in Coastal Management

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** 2x1 hour lectures and 1x3h practical/week **Prerequisites:** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **Prohibitions:** GEOS3914 or MARS3104 **Assessment:** One 2 hour exam, two project reports, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Coastal Management is about how scientific knowledge is used to support policy formulation and planning decisions in coastal environments. The course links coastal science to policy and practice in management of estuaries, beaches and the coastal ocean. The principles are exemplified through specific issues, such as coastal erosion, pollution, and impacts of climate-change. The issues are dealt with in terms of how things work in nature, and how the issues are handled through administrative mechanisms. These mechanisms involve planning strategies like Marine Protected Areas and setback limits on civil development in the coastal zone. The coastal environments and processes that are more relevant to coastal management including: rocky coasts; beaches, barriers and dunes;

and coral reefs will also be introduced. At a practical level, the link between science and coastal management is given substance through development and use of 'decision-support models'. These models involve geocomputing methods that entail application of simulation models, remotely sensed information, and Geographic Information Systems (GIS). The course therefore includes both principles and experience in use of these methods to address coastal-management issues. (It thus also involves extensive use of computers.) Although the focus is on the coast, the principles and methods have broader relevance to environmental management in particular, and to problem-solving in general. That is, the course has vocational relevance in examining how science can be exploited to the benefit of society and nature conservation.

GEOS3914
GIS in Coastal Management (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** Two hours of lectures, one 3 hour practical per week comprising one 1 hour practical demonstration and one 2 hour practical **Prerequisites:** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **Prohibitions:** GEOS3014 or MARS3104 **Assessment:** One 2 hour exam, project work, two practical-based project reports, fortnightly progress quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3014 but will carry out more challenging projects, practicals, assignments and tutorials.

GEOS3103
Environmental and Sedimentary Geology

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3803 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical reports and quizes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Sediments and sedimentary rocks cover most of the Earth's surface, record much of the Earth's geological and climatic history and host important resources such as petroleum, coal, water and mineral ores. The aim of this unit is to provide students with the skills required to examine, describe and interpret sediments and sedimentary rocks for a variety of different purposes. Specific foci of the unit will be the identification of the recent or ancient environment in which sedimentary materials were deposited, the environmental controls which produce sedimentary structures, and the processes that control the production, movement and storage of sediment bodies. On completion of this unit students will be familiar with the natural processes that produce and modify sediments across a range of environments at the Earth's surface, including fluvial, aeolian, lacustrine, marginal marine and deep marine environments. The various controls on the sedimentary record such as climate and sea-level change, as well as diagenesis and geochemical cycles will also be discussed. Practical exercises will require students to examine global datasets, and determine the properties and significance of sediments and sedimentary rocks. The course is relevant to students interested in petroleum or mineral exploration, environmental and engineering geology as well as marine geoscience.

Textbooks

Course notes will be available from the Copy Centre and an appropriate set of reference texts will be placed on special reserve in the library.

GEOS3803
Environmental and Sedimentary Geology(Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3103 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical, field reports and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3103 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Textbooks

Course notes will be available from the Copy Centre and appropriate set of reference texts will be placed on special reserve in the library.

GEOS3053
Southeast Asia Field School

Credit points: 6 **Teacher/Coordinator:** Dr Jeff Neilson **Session:** Intensive July **Classes:** 3 pre-departure classes during Semester 1, up to three weeks in-country intensive involving lectures, fieldwork and field-based methods training, readings and small group discussions **Prerequisites:** 6 credit points of Intermediate units of study in Geography. **Prohibitions:** GEOG3201 or GEOS3953 **Assessment:** Group participation, one consolidation report, one exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Students must contact the unit coordinator no later than September in the year before taking this unit.

The unit of study can be taken only with prior permission from the unit of study coordinator. It constitutes a Field School run over a two to three week period in July, prior to the commencement of the second semester. In 2016, the Field School will be held in Indonesia. In other years it may be held in mainland Southeast Asia. The Field School focuses on three main themes; rural social, environmental and economic change; regional economic integration and its local effects; regional environmental change and natural resources governance. The Field School is run in close association with local universities, whose staff and students participate in some components of the course. Places are limited, and students interested in the 2016 Field School should indicate expression of interest to Dr Jeff Neilson by 26th September 2015.

GEOS3953
Southeast Asia Field School (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Jeff Neilson **Session:** Intensive July **Classes:** 3 pre-departure classes during Semester 1, up to three weeks in-country intensive involving lectures, fieldwork and field-based methods training, readings and small group discussions **Prerequisites:** 6 credit points of Intermediate units of study in Geography. **Prohibitions:** GEOS3053 **Assessment:** Group participation, one consolidation report, one exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Students must contact the unit coordinator no later than September in the year before taking this unit.

The unit of study can be taken only with prior permission from the unit of study coordinator. It constitutes a Field School run over a two to three week period in July, prior to the commencement of the second semester. In 2016, the Field School will be held in Indonesia. In other years it may be held in mainland Southeast Asia. The Field School focuses on three main themes; rural social, environmental and economic change; regional economic integration and its local effects; regional environmental change and natural resources governance. The Field School is run in close association with local universities, whose staff and students participate in some components of the course. Places are limited, and students interested in the 2016 Field School should indicate expression of interest to Dr Jeff Neilson by 26th September 2015.

Geology and Geophysics

Study in the discipline of Geology and Geophysics is offered by the School of Geosciences in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

A major in Geology and Geophysics provides an interdisciplinary and integrative context for understanding the surface and internal planetary processes that determine how the earth functions as a system. Global climate change, an increasing population and shrinking mineral and energy resources have heightened our sense of dependence on our earth's complex natural systems and increased our need to understand the dynamic relationships between the continents and oceans that provide the physical habitat for the earth's various ecosystems, as well as the resources our modern society needs.

This major will provide you with an understanding of the origin of our planet, its evolution across geological time through the complex interaction between its internal geodynamic, plate tectonics, surface processes and biological processes. This major will equip you with the expertise necessary for possible employment in areas of sustainable exploration and management of our natural, mineral and energy resources. You will gain observational, analytical, computational, and communication skills transferable to a broad range of industries including education, insurance and banking.

Requirements for completion

A major in Geology and Geophysics requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)12 credit points of 3000-level core units
(iv)12 credit points of 3000-level selective units

A minor in Geology and Geophysics is available and articulates to this major.

First year

GEOS1X01 and GEOS1X03 provide a foundational understanding of the earth system, its history and dynamics, concepts of geological time, and core concepts that underpin the discipline of Geology. You will examine a range of themes and issues relative to the future of our planet, learn about the origin and fate of common earth materials and how to identify and interpret them. You will develop expertise in spatial and numerical analysis and in the use of tools for representing and interpreting geology and geological processes.

Second year

GEOS2X14 and GEOS2X24 both build on foundational concepts from first year, and provide a comprehensive understanding of composition, evolution and dynamics of the earth's crust. GEOS2X14 will explore tectonic and geodynamic processes in the deep earth's crust, and consider the implications of these processes for the mineralogy, petrology and geochemistry of magmatic systems and associated mineral deposits. GEOS2X24 introduces students to the surface processes involved in the formation of sedimentary rocks in various sedimentary environments, as well as the techniques we use to determine their ages, environments of deposition and tectonic evolution. Students will learn major fossil groups, methods of stratigraphic age determination, and how the earth's upper crust is deformed.

Third year

GEOS3X08 and GEOS3X01 are the core units at the 3000-level, proving a conceptual framework for professional practice in geology, resource exploration, and related fields. GEOS3X08 draws together learning outcomes from the 1000 and 2000-levels and applies them in the context of field geology including field mapping, rock identification, structural analyses, laboratory-based analyses, and the use of numerical tools and models. In GEOS3X01 students learn about the forces that drive the deformation and differentiation of the Earth's crust and that of mineralized systems, through tectonic processes, metamorphic processes and partial melting. In addition to these core units, students may choose from a selection of units that provide 3000-level training in specialist areas of geological research and practice, ranging from the geological context of hydrocarbons, ores, and other valuable minerals, to commonly-used geophysical methods, to exploration of the Earth's interior and how to model its landscapes.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework

The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours

Requirements for Honours in the area of Geology and Geophysics: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/science/geosciences/undergrad/ug_geol.shtml
E allyson.montenegro@sydney.edu.au
T +61 2 9351 2912

Address:
School of Geosciences
Room 348, Madsen Building F09
University of Sydney NSW 2006

Associate Professor Patrice Rey
T + 61 2 9351 2067
E patrice.rey@sydney.edu.au

Learning Outcomes

Students who graduate from Geology and Geophysics will be able to:

1. Understand geology and geophysics in the broader context of Earth system science.
2. Identify key Earth systems and articulate the interaction between chemical, physical and biological processes that govern the co-evolution of life and Earth
3. Demonstrate a comprehensive understanding of the Earth structure, its internal and external dynamics and evolution
4. Collect, record, compile, process, critically evaluate analyse and interpret, qualitative and quantitative geological, geochemical and geophysical data in order to construct robust and verifiable models and assess scientific arguments
5. Integrate a range of geological, geochemical and geophysical methods and approaches, with computational resources to address and model geological phenomena at a variety of scales in space and time;
6. Use a range of techniques, competently communicate the rationale for scientific endeavours, methods and approaches
7. Work competently, confidently, ethically and safely in field or laboratory, and in the context of interdisciplinary and multicultural environment
8. Demonstrate a familiarity with the legislative, regulatory and normative context in which resources industries operate.

Geology and Geophysics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
GEOLOGY AND GEOPHYSICS			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Geology and Geophysics major			
A major in Geology and Geophysics requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units (iv) 12 credit points of 3000-level selective units			
Geology and Geophysics minor			
A minor in Geology and Geophysics requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
GEOS1003 **Introduction to Geology**	6	**N** GEOS1903 or GEOL1002 or GEOL1902 or GEOL1501	Semester 2 Summer Main
GEOS1901 **Earth, Environment and Society Advanced**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 *Note: Department permission required for enrolment*	Semester 1
GEOS1903 **Introduction to Geology (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1003 or GEOL1002 or GEOL1902 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
GEOS2114 **Volcanoes, Hot Rocks and Minerals**	6	**P** A minimum of one unit of study from the following (GEOG1001, GEOL1001, GEOL1002, GEOS1003, GEOS1903, ENVI1002, GEOL1902, GEOL1501), and 24 credit points of Junior Science units of study. **N** GEOL2111 or GEOL2911 or GEOS2914 *An optional volcano field study trip to New Zealand's North Island in February is available for up to 20 students. Extra costs apply. Contact with the School in the preceding November or December is advisable to secure a place on the trip.*	Semester 1
GEOS2124 **Fossils and Tectonics**	6	**P** 24cp of 1000-level units of study, including (GEOS1003 or GEOS1903) and (GEOS2114 or GEOS2914) **N** GEOL2123 or GEOL2124 or GEOS2924	Semester 2
GEOS2914 **Volcanoes, Hot Rocks and Minerals Adv**	6	**P** 24 credit points of Junior Science units of study and Distinction in (GEOL1002 or GEOS1002 or ENVI1002 or GEOL1501 or GEOL1902 or GEOS1902 or GEOS1003 or GEOS1903). **N** GEOS2114 or GEOL2001 *An optional volcano field study trip to New Zealand's North Island in February is available for up to 20 students. Extra costs apply. Contact with the School is the preceding November or December is advisable to secure a place on the trip.*	Semester 1
GEOS2924 **Fossils and Tectonics (Advanced)**	6	**P** A mark of 75 or above in [(GEOS1003 or GEOS1903) or (GEOS2114 or GEOS2914)] **N** GEOL2123 or GEOL2124 or GEOS2124	Semester 2
3000-level units of study			
Core			
GEOS3008 **Field Geology**	6	**P** GEOS2124 or GEOS2924 **N** GEOL3103 or GEOS3908 *Note: Department permission required for enrolment*	Intensive July

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
GEOS3908 **Field Geology (Adv)**	6	**P** Credit or greater in (GEOS2124 or GEOS2924) **N** GEOS3008 *Note: Department permission required for enrolment*	Intensive July
GEOS3101 **Earth's Structure and Evolution**	6	**P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3801 or GEOS3003 or GEOS3903 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917	Semester 1
GEOS3801 **Earth's Structure and Evolutions (Adv)**	6	**P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3101 or GEOS3003 or GEOS3903 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 *Prerequisites: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 1
Selective			
GEOS3102 **Global Energy and Resources**	6	**P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3802 or GEOS3003 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 or GEOS3903	Semester 1
GEOS3103 **Environmental and Sedimentary Geology**	6	**A** (GEOS1003 or GEOS1903) **P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3803	Semester 2
GEOS3104 **Geophysical Methods**	6	**P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3804 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 or GEOS3004	Semester 2
GEOS3802 **Global Energy and Resources (Adv)**	6	**P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3102 or GEOS3003 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 or GEOS3903 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 1
GEOS3803 **Environmental and Sedimentary Geology(Adv)**	6	**A** (GEOS1003 or GEOS1903) **P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3103 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 2
GEOS3804 **Geophysical Methods (Advanced)**	6	**P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3104 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 2

Geology and Geophysics

GEOLOGY AND GEOPHYSICS

Advanced coursework and projects will be available in 2020 for students who complete this major.

Geology and Geophysics major

A major in Geology and Geophysics requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units(iv) 12 credit points of 3000-level selective units

Geology and Geophysics minor

A minor in Geology and Geophysics requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

GEOS1001
Earth, Environment and Society

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the gateway unit of study for Human Geography, Physical Geography, Environmental Studies and Geology. Its objective is to introduce the big questions relating to the origins and current state of the planet: climate change, environment, landscape formation, and the growth of the human population. During the semester you will be introduced to knowledge, theories and debates about how the world's physical and human systems operate. The first module investigates the evolution of the planet through geological time, with a focus on major Earth systems such as plate tectonics and mantle convection and their interaction with the atmosphere, hydrosphere, biosphere and human civilisations. The second module presents Earth as an evolving and dynamic planet, investigating global environmental change, addressing climate variability and human impacts on the natural environment and the rate at which these changes occur and how they have the potential to dramatically affect the way we live. Finally, the third module, focuses on human-induced challenges to Earth's future. This part of the unit critically analyses the relationships between people and their environments, with central consideration to debates on population change, resource use and the policy contexts of climate change mitigation and adaptation.

GEOS1003
Introduction to Geology

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2, Summer Main **Classes:** Two 1 hour lectures and one 3 hour practical per week **Prohibitions:** GEOS1903 or GEOL1002 or GEOL1902 or GEOL1501 **Assessment:** One 2 hour exam, quizzes, tests, practical reports, field report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit of study is to examine the chemical and physical processes involved in mineral formation, the interior of the Earth, surface features, sedimentary environments, volcanoes, and metamorphism. Lectures and laboratory sessions on mountain building processes and the formation of mineral deposits will lead to an understanding of the forces controlling the geology of our planet. Processes such as weathering, erosion and nature of sedimentary environments are related to the origin of the Australian landscape. In addition to laboratory classes there is a one-day excursion to the western Blue Mountains and Lithgow to examine geological objects in their setting.

Textbooks

The recommended text is is Christiansen, E. H., and Hamblin, W. K. (2015). Dynamic earth: An introduction to physical geology. Burlington, MA: Jones and Bartlett Learning.

GEOS1901
Earth, Environment and Society Advanced

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1001, but will be required to carry out more challenging practical assignments.

GEOS1903
Introduction to Geology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour practical per week, field classes. **Prohibitions:** GEOS1003 or GEOL1002 or GEOL1902 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** One 2 hour exam, tests, quizzes, practical reports, field report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit has the same objectives as GEOS1003 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their ATAR or UAI and/or their university performance at the time of enrolment. Students that elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. This unit may be taken as part of the BSc (Advanced).

Textbooks

The recommended text is Christiansen, E. H., and Hamblin, W. K. (2015). Dynamic earth: An introduction to physical geology. Burlington, MA: Jones and Bartlett Learning.

2000-level units of study

Core

GEOS2114
Volcanoes, Hot Rocks and Minerals

Credit points: 6 **Teacher/Coordinator:** A/Prof Derek Wyman, A/Prof Patrice Rey **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week. **Prerequisites:** A minimum of one unit of study from the following (GEOG1001, GEOL1001, GEOL1002, GEOS1003, GEOS1903, ENVI1002, GEOL1902, GEOL1501), and 24 credit points of Junior Science units of study. **Prohibitions:** GEOL2111 or GEOL2911 or GEOS2914 **Assessment:** One 2 hour exam, practical reports, field trip report, group presentation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: An optional volcano field study trip to New Zealand's North Island in February is available for up to 20 students. Extra costs apply. Contact with the School in the preceding November or December is advisable to secure a place on the trip.

This unit of study relates plate tectonics to a) volcanoes and magma systems that create them; b) the formation of precious metal and gemstone ores; and c) an understanding of how Earth's materials (minerals, rocks, rock formations, lithospheric plates etc.) respond to stresses and the forces that deform them. Methods of analysis involve studies at the microscopic scale (performed on thin sections) and the mesoscopic scale performed on hand specimens and outcrops. The unit includes a day field trip to study an extinct volcano in NSW. Practical work includes independent study of igneous systems, rocks and minerals employing both microscope-based techniques and computer modelling.

GEOS2124
Fossils and Tectonics

Credit points: 6 **Teacher/Coordinator:** A/Prof Patrice Rey (Coordinator), Dr Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures plus one 2 hour practical each week. **Prerequisites:** 24cp of 1000-level units of study, including (GEOS1003 or GEOS1903) and (GEOS2114 or GEOS2914) **Prohibitions:** GEOL2123 or GEOL2124 or GEOS2924 **Assessment:** One 2 hour exam, practical reports, field report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to convey how fossils, stratigraphic and structural data are used together to determine ages and environments and the deformation history of rock layers. It covers an introduction to historical geology and the evolution of the major fossils groups. Methods of stratigraphic age determination include litho-, bio-, chemo-, magneto-stratigraphy, as well as radiometric geochronology and the stratigraphic characteristics of the main geological time intervals. Structural methods are focused on brittle deformation in the upper crust and sediments. Students will gain familiarity with the most important fossil groups and how to identify them, and with the most important types of faults and folds. The formation of fossil fuels such as coal, oil and gas will also be covered in an earth history and resource exploration context. The simultaneous use of fossils, stratigraphy and structure to unravel the geological history of a set of exposed rock layers is demonstrated during a field excursion to Yass.

Textbooks

Class notes for the stratigraphy and fossils part will be available for purchase from The University Copy Centre.
The following textbooks will be used for the structural geology component:
- Van der Pluijm, B.A., and S. Marshak, 2004: Earth Structure: An Introduction to Structural Geology and Tectonics, 656p. W.W. Norton and Company, Inc, ISBN: 0-393-92467-X.
- Haakon Fossen, 2010. Structural Geology. 2010. Cambridge University Press, 480 p. ISBN: 9780521516648

GEOS2914
Volcanoes, Hot Rocks and Minerals Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Derek Wyman, A/Prof Patrice Rey, Dr Nicolas Flament **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week. **Prerequisites:** 24 credit points of Junior Science units of study and Distinction in (GEOL1002 or GEOS1002 or ENVI1002 or GEOL1501 or GEOL1902 or GEOS1902 or GEOS1003 or GEOS1903). **Prohibitions:** GEOS2114 or GEOL2001 **Assessment:** One 2 hour exam, practical reports, field trip report, group presentation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: An optional volcano field study trip to New Zealand's North Island in February is available for up to 20 students. Extra costs apply. Contact with the School is the preceding November or December is advisable to secure a place on the trip.

This unit has the same objectives as GEOS2114 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students that elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. This unit may be taken as part of the BSc (Advanced).

Textbooks

No required textbook. Course notes available.

GEOS2924
Fossils and Tectonics (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Patrice Rey (Coordinator), Dr Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures plus one 2 hour practical each week. **Prerequisites:** A mark of 75 or above in [(GEOS1003 or GEOS1903) or (GEOS2114 or GEOS2914)] **Prohibitions:** GEOL2123 or GEOL2124 or GEOS2124 **Assessment:** One 2 hour exam, practical reports, field report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as GEOS2124 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students that elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. This unit may be taken as part of the BSc (Advanced).

Textbooks

The same as for GEOS2124.

3000-level units of study

Core

GEOS3008
Field Geology

Credit points: 6 **Teacher/Coordinator:** Prof Geoffrey Clarke **Session:** Intensive July **Classes:** 14 days of field work (weeks 1-7) **Prerequisites:** GEOS2124 or GEOS2924 **Prohibitions:** GEOL3103 or GEOS3908 **Assessment:** The field work will be assessed by written reports (up to 10 pages in total), field exercises and practical tests (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is an essential component of the Geology and Geophysics major. Students will undertake a range of exercises, including: the field mapping and the analysis of geological objects in the field, in weakly to complexly deformed sedimentary and volcanic sequences; the field investigations of mineral deposits and their relationships to host rocks; and the practical application of geophysical methods in field mapping. The field course complements other subject areas in Geology and Geophysics and will give students experience in the field identification of rocks and minerals, regional geology, stratigraphy, structure and rock relationships. The educational objectives of the excursion involve concentrated learning met in two compulsory one-day workshops and the field excursion. Due to the nature of the exercises, there are no alternatives to attending the excursion and workshops, and students must attend and satisfactorily complete all components of the unit to pass. Students will be required to pay the cost of transport and hostel-style accommodation during fieldwork, which may involve camping. All participants need be physically capable of completing day walks at remote locations in central Australia, have previously discussed with the School any personal health and safety issues that could affect their participation in remote area fieldwork, and must submit a signed student travel form that includes up-to-date emergency contact details. In addition, it expected that students will have attained competency in HLTFA311A Apply First Aid (or equivalent) through a registered training organization.

GEOS3908
Field Geology (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Geoffrey Clarke **Session:** Intensive July **Classes:** 14 days of fieldwork. **Prerequisites:** Credit or greater in (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3008 **Assessment:** Written reports and field exercises (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit has the same objectives as GEOS3008 and is suitable for students who wish to pursue aspects of the subject in greater depth.

Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week prior to the field camp which is usually in the break between semester 1 and 2. This unit of study may be taken as part of the BSc (Advanced).

GEOS3101
Earth's Structure and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Patrice Rey **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week, and a 3-day excursion. **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3801 or GEOS3003 or GEOS3903 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 **Assessment:** One 2 hour exam, practical and field reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The Earth's crust and upper mantle, or lithosphere, are a consequence of dynamic and thermal processes operating since the beginning of the Archaean. This unit focuses on information and techniques that enable an understanding of these processes. The main topics presented in this unit include: the formation and evolution of oceanic and continental lithosphere; tectonic deformation, magmatism and metamorphism at plate boundaries; and the mesoscopic and microscopic analysis of igneous and metamorphic rocks. Practical classes and field exercises are designed to enable students to competently and independently identify the common crystalline rocks in hand-specimen; and to gather and interpret the structural field data which enables the determination of the structural style and deformational history presented in particular tectonic settings. The concepts and content presented in this unit are generally considered to be essential knowledge for geologists and geophysicists and provide a conceptual framework for their professional practice. Students wishing to specialise in the field and become professional geologists will normally need to expand upon the knowledge gained from this unit and either complete an honours project or progress to postgraduate coursework in this field.

GEOS3801
Earth's Structure and Evolutions (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Patrice Rey **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3101 or GEOS3003 or GEOS3903 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 **Assessment:** One 2 hour exam, practical and field reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Prerequisites: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3101 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Selective

GEOS3102
Global Energy and Resources

Credit points: 6 **Teacher/Coordinator:** A/Prof Derek Wyman, Prof Dietmar Müller **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 2-hour tutorial/practicals per week. **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3802 or GEOS3003 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 or GEOS3903 **Assessment:** One 2-hour exam, practical and reports (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines the processes that form energy and mineral resources, outlines the characteristics of major fossil fuel and metal ore deposits and introduces the principles that underpin exploration strategies used to discover and develop geological resources. The unit will focus on a variety of topics including: coal; petroleum formation and migration, hydrocarbon traps and maturation; precious metal, base metal and gemstone deposit types; and exploration strategies. An integrated approach will relate tectonic processes through time to the formation of fossil fuel and mineral provinces. Practical exercises will introduce students to the techniques used to identify economically viable geological resources using a variety of exercises based on actual examples of resource exploration drawn from both the petroleum and minerals industry.

GEOS3103
Environmental and Sedimentary Geology

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3803 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical reports and quizes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Sediments and sedimentary rocks cover most of the Earth's surface, record much of the Earth's geological and climatic history and host important resources such as petroleum, coal, water and mineral ores. The aim of this unit is to provide students with the skills required to examine, describe and interpret sediments and sedimentary rocks for a variety of different purposes. Specific foci of the unit will be the identification of the recent or ancient environment in which sedimentary materials were deposited, the environmental controls which produce sedimentary structures, and the processes that control the production, movement and storage of sediment bodies. On completion of this unit students will be familiar with the natural processes that produce and modify sediments across a range of environments at the Earth's surface, including fluvial, aeolian, lacustrine, marginal marine and deep marine environments. The various controls on the sedimentary record such as climate and sea-level change, as well as diagenesis and geochemical cycles will also be discussed. Practical exercises will require students to examine global datasets, and determine the properties and significance of sediments and sedimentary rocks. The course is relevant to students interested in petroleum or mineral exploration, environmental and engineering geology as well as marine geoscience.

Textbooks

Course notes will be available from the Copy Centre and an appropriate set of reference texts will be placed on special reserve in the library.

GEOS3104
Geophysical Methods

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Muller (co-ordinator), A/Prof Patrice Rey, Dr Tristan Salles, Dr Gilles Brocard **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour practical class per week. **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3804 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 or GEOS3004 **Assessment:** One 2 hour exam (50%), practical work (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces the common geophysical methods used to investigate the interior and dynamics of the Earth and focuses on the techniques used for mineral and hydrocarbon exploration. On completion of this unit students will have developed a thorough understanding of the common geophysical methods utilised in industry and academia. They will be able to evaluate and critically assess most forms of geophysical data as well as actively participate in geophysical exploration. The course will provide the students with the computational skills to process different types of geophysical data and link them to simulations of Earth processes through time, especially focussing on linking deep Earth and surface processes, such as subsidence/uplift and erosion/sedimentation. The unit is aimed at students with interests in land-based and marine exploration, plate tectonics, internal earth structure/dynamics, and near-surface investigations of groundwater resources and environmental pollution. Students wishing to specialise in the field and become professional geophysicists will need to expand upon the geophysics knowledge gained from this unit and either complete an honours project or progress to postgraduate coursework in this field.

GEOS3802
Global Energy and Resources (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Derek Wyman, Prof Dietmar Müller **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3102 or GEOS3003 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 or GEOS3903 **Assessment:** One 2 hour exam, practical and field reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3102 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

GEOS3803
Environmental and Sedimentary Geology(Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3103 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical, field reports and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3103 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Textbooks

Course notes will be available from the Copy Centre and appropriate set of reference texts will be placed on special reserve in the library.

GEOS3804
Geophysical Methods (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Müller (co-ordinator), A/Prof Patrice Rey, Dr Tristan Salles, Dr Gilles Brocard **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3104 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 **Assessment:** One 2 hour exam, practical work (100%) **Practical field work:** Geophysical Field Prac (details to be announced) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3104 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independant work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Health

Study in the Health stream and major is offered by the Discipline of Behavioural and Social Sciences in Health at the Faculty of Health Sciences. Units of study are interdisciplinary and offered at the standard level.

About the stream

A stream in Health will equip you with a comprehensive understanding of health and health systems at the local, national, and global levels. Through our active, real-world learning approaches, your ability to navigate the complexity of health in different sociocultural, political and economic contexts will be nurtured and refined. You will develop core skills in critical thinking, complex problem solving, communication and empathy. The major provides you with a strong foundation in health and healthcare, while giving you the flexibility for in-depth study in particular areas of health of interest to you.

Requirements for completion

The Health stream requires 60 credit points, consisting of:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level selective units
(iii)A 48 credit point major in Health

A major in Health requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)6 credit points of 3000-level research units
(iv)6 credit points of 3000-level interdisciplinary project units
(v)6 credit points of 3000-level disciplinary project units
(vi)6 credit points of 3000-level selective units

First year

Core to Major: HSBH1012 and HSBH1013
Core to Stream: PSYC1002 and 6 credit points from a selection of: BIOL1XX6, BIOL1XX7, BIOL1XX8

Second year

Core: HSBH2007 and HSBH2009

In second year, we build on your understanding of health, the healthcare systems in Australia and abroad, and the people in health. These units introduce you to health research and eHealth innovations. You will have more in-depth discussions and case studies around knowledge creation in health, and how technology impacts our health, and can be used to enhance health. This understanding will support you in being effective in the eHealth-enabled healthcare environment that you will be working in.

Third year

Students must select 6 credit points of 3000-level research units, 6 credit points of 3000-level interdisciplinary project units, 6 credit points of 3000-level disciplinary project units and 6 credit points of 3000-level selective units. Details of selectives available can be found in the unit of study tables for the Health major

These third year units are designed to provide you with the flexibility to choose to study the areas of health that interest you in greater depth. In your third year you must take four 3000-level units consisting of at least one senior research unit, one unit with a disciplinary project, and one unit with an interdisciplinary unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework

The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Health: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/health-sciences/about/campus.shtml
T 1800 793 864

Dr Melanie Keep
E melanie.keep@sydney.edu.au

Learning Outcomes

Students who graduate from Health will be able to:

1. Develop evidence-based, ethical and innovative solutions to health problems at the individual, national and global scales that are sensitive to the specific needs, perspectives and worldview of that individual or community.
2. Advocate for improvements in health through synthesis of evidence, critical reflection and analysis, and awareness of the sociocultural factors which affect health decisions.
3. Enhance our current understanding of health and health systems through research and enquiry.
4. Communicate effectively with and to others from different backgrounds and at different life stages using a variety of tools, media and strategies appropriate to that audience.
5. Work collaboratively and effectively in interdisciplinary teams
6. Act ethically and with cultural sensitivity in their interactions with others and approaches to designing, implementing and evaluating health solutions.

Health

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
HEALTH			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Health stream			
The Health stream is 60 credit points, consisting of: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) A 48 credit point major in Health *Note that while it is not required, Human Movement is available as a second major or minor only to students enrolled in the Health stream.			
Health major			
This major is only available as a Table A major to students enrolled in the Health stream.			
A major in Health requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 6 credit points of 3000-level research units (iv) 6 credit points of 3000-level interdisciplinary project units (v) 6 credit points of 3000-level disciplinary project units (vi) 6 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Stream core			
PSYC1002 **Psychology 1002**	6	*This unit is also offered in the Sydney Summer School. For more information consult the web site: http://sydney.edu.au/summer/*	Semester 2 Summer Main
Stream selective			
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Major core			
HSBH1012 **Introduction to Health and Health Care**	6		Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
HSBH1013 **Society and Health**	6		Semester 2
2000-level units of study			
Major Core			
HSBH2007 **Research Methods in Health**	6	**P** HSBH1006 and HSBH1008 and HSBH1009 **N** BACH2140 or HSBH1007	Semester 1
HSBH2009 **Innovations in eHealth**	6	**A** HSBH1012, HSBH1013 **N** HSBH1010	Semester 2
3000-level units of study			
Research units			
HSBH3005 **Evidence Based Health Care**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 2
HSBH3018 **Quantitative Research Methods in Health**	6	**P** HSBH1007 or HSBH2007 **N** PSYC2012 or SCLG3603	Semester 1
HSBH3019 **Qualitative Research Methods in Health**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **N** SCLG2602 or BACH4056	Semester 2
HSBH3024 **Designing a Research Project**	6	**P** (HSBH1006 AND (HSBH1007 OR HSBH2007) AND HSBH1008 AND HSBH1009) OR ((BACH1161 OR HSBH1003) AND HSBH1007)	Semester 2
Interdisciplinary project units			
HSBH3003 **Health Service Strategy and Policy**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 2
HSBH3004 **Health, Ethics and the Law**	6	**P** 48 credit points of units	Semester 1
HSBH3011 **Rural Health**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 1
HSBH3012 **FHS Abroad**	6	**P** Successful completion of all 1st year units in an undergraduate FHS degree *Students interested in participating must obtain permission from their course director before enrolling in FHS Abroad. Some degrees require participants have a minimum credit average.*	Semester 1 Semester 2
HSBH3013 **FHS Indigenous Communities**	6	**P** Successful completion of all 1st year units in an undergraduate FHS degree	Semester 2
HSBH3016 **Individual and Societal Ageing**	6	**P** BACH1161 or HSBH1003 or HSBH1008 *Bachelor of Health Sciences students must have completed 24 credit points of HSBH junior units for enrolment into this unit. All other students must have completed 48 credit points.*	Semester 2
REHB3064 **Alcohol and Drug Misuse Rehabilitation**	6	**P** (HSBH1006, (HSBH1007 or HSBH2007), HSBH1008, HSBH1009) or 48 credit points of previous study. **N** REHB3061 *Students must have completed 48 credit points to enrol in this unit*	Semester 1
HSBH3026 to be developed for offering in 2019.			
Disciplinary project units			
HSBH3001 **Health and Indigenous Populations**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009) or (BACH1161 or HSBH1003)	Semester 1 Semester 2
HSBH3003 **Health Service Strategy and Policy**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 2
HSBH3004 **Health, Ethics and the Law**	6	**P** 48 credit points of units	Semester 1
HSBH3009 **International Health**	6	**P** 48 credit points of units **N** BACH3128	Semester 2
HSBH3011 **Rural Health**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 1
HSBH3012 **FHS Abroad**	6	**P** Successful completion of all 1st year units in an undergraduate FHS degree *Students interested in participating must obtain permission from their course director before enrolling in FHS Abroad. Some degrees require participants have a minimum credit average.*	Semester 1 Semester 2
HSBH3013 **FHS Indigenous Communities**	6	**P** Successful completion of all 1st year units in an undergraduate FHS degree	Semester 2
HSBH3015 **Mental Health Rehabilitation**	6	**P** (HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009) or (48 credit points of previous study with a miminum of 24 from Intermediate units of study) *Students must have completed at least 48 credit points to enrol in this UoS*	Semester 1
HSBH3016 **Individual and Societal Ageing**	6	**P** BACH1161 or HSBH1003 or HSBH1008 *Bachelor of Health Sciences students must have completed 24 credit points of HSBH junior units for enrolment into this unit. All other students must have completed 48 credit points.*	Semester 2
HSBH3018 **Quantitative Research Methods in Health**	6	**P** HSBH1007 or HSBH2007 **N** PSYC2012 or SCLG3603	Semester 1
HSBH3022 **Health Promotion: Principles and Practice**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
HSBH3023 **BHS Work Integrated Learning Placement**	6	**A** Introductory neuroscience **P** (BIOL1001 OR BIOL1003) AND (PSYC1001 OR PSYC1002) AND at least 12cp from the list of BHlthSci senior units of study AND at least 24cp of units of study from the second major **N** HSBH3012, HSBH3013, CSCD3090 *Eligible students will require permission from the Course Director to enrol in this unit of study. Enrolment will be subject to availability of suitable placements.*	Semester 2
HSBH3024 **Designing a Research Project**	6	**P** (HSBH1006 AND (HSBH1007 OR HSBH2007) AND HSBH1008 AND HSBH1009) OR ((BACH1161 OR HSBH1003) AND HSBH1007)	Semester 2
Selective			
HSBH3001 **Health and Indigenous Populations**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009) or (BACH1161 or HSBH1003)	Semester 1 Semester 2
HSBH3003 **Health Service Strategy and Policy**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 2
HSBH3004 **Health, Ethics and the Law**	6	**P** 48 credit points of units	Semester 1
HSBH3005 **Evidence Based Health Care**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 2
HSBH3009 **International Health**	6	**P** 48 credit points of units **N** BACH3128	Semester 2
HSBH3010 **Health and Lifelong Disability**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 2
HSBH3011 **Rural Health**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 1
HSBH3012 **FHS Abroad**	6	**P** Successful completion of all 1st year units in an undergraduate FHS degree *Students interested in participating must obtain permission from their course director before enrolling in FHS Abroad. Some degrees require participants have a minimum credit average.*	Semester 1 Semester 2
HSBH3013 **FHS Indigenous Communities**	6	**P** Successful completion of all 1st year units in an undergraduate FHS degree	Semester 2
HSBH3015 **Mental Health Rehabilitation**	6	**P** (HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009) or (48 credit points of previous study with a miminum of 24 from Intermediate units of study) *Students must have completed at least 48 credit points to enrol in this UoS*	Semester 1
HSBH3016 **Individual and Societal Ageing**	6	**P** BACH1161 or HSBH1003 or HSBH1008 *Bachelor of Health Sciences students must have completed 24 credit points of HSBH junior units for enrolment into this unit. All other students must have completed 48 credit points.*	Semester 2
HSBH3018 **Quantitative Research Methods in Health**	6	**P** HSBH1007 or HSBH2007 **N** PSYC2012 or SCLG3603	Semester 1
HSBH3019 **Qualitative Research Methods in Health**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **N** SCLG2602 or BACH4056	Semester 2
HSBH3022 **Health Promotion: Principles and Practice**	6	**P** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009	Semester 1
HSBH3023 **BHS Work Integrated Learning Placement**	6	**A** Introductory neuroscience **P** (BIOL1001 OR BIOL1003) AND (PSYC1001 OR PSYC1002) AND at least 12cp from the list of BHlthSci senior units of study AND at least 24cp of units of study from the second major **N** HSBH3012, HSBH3013, CSCD3090 *Eligible students will require permission from the Course Director to enrol in this unit of study. Enrolment will be subject to availability of suitable placements.*	Semester 2
HSBH3024 **Designing a Research Project**	6	**P** (HSBH1006 AND (HSBH1007 OR HSBH2007) AND HSBH1008 AND HSBH1009) OR ((BACH1161 OR HSBH1003) AND HSBH1007)	Semester 2
REHB3064 **Alcohol and Drug Misuse Rehabilitation**	6	**P** (HSBH1006, (HSBH1007 or HSBH2007), HSBH1008, HSBH1009) or 48 credit points of previous study. **N** REHB3061 *Students must have completed 48 credit points to enrol in this unit*	Semester 1

Health

HEALTH

Advanced coursework and projects will be available in 2020 for students who complete this major.

Health stream

The Health stream is 60 credit points, consisting of:(i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level selective units (iii) A 48 credit point major in Health*Note that while it is not required, Human Movement is available as a second major or minor only to students enrolled in the Health stream.

Health major

This major is only available as a Table A major to students enrolled in the Health stream.A major in Health requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 6 credit points of 3000-level research units (iv) 6 credit points of 3000-level interdisciplinary project units (v) 6 credit points of 3000-level disciplinary project units (vi) 6 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Stream core

PSYC1002
Psychology 1002

Credit points: 6 **Session:** Semester 2, Summer Main **Classes:** Three 1 hour lectures and one 1 hour tutorial per week, plus 1 hour per week of additional web-based (self-paced) material related to the tutorial. **Assessment:** One 2.5hr exam, one 1000 word research report, multiple tutorial tests, experimental participation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is also offered in the Sydney Summer School. For more information consult the web site: http://sydney.edu.au/summer/

Psychology 1002 is a further general introduction to the main topics and methods of psychology, and it is the basis for advanced work as well as being of use to those not proceeding with the subject. Psychology 1002 covers the following areas: neuroscience; human mental abilities; learning and motivation; visual perception; cognitive processes; abnormal psychology.

This unit is also offered in the Sydney Summer School. For more information consult the web site:

http://sydney.edu.au/summer_school/

Textbooks
Available on-line once semester commences

Stream selective

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks

TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit

will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

Major core

HSBH1012
Introduction to Health and Health Care

Credit points: 6 **Session:** Semester 1 **Classes:** 2-hr lecture/week, 1-hr tutorial/week **Assessment:** seminar presentation (20%), essay (35%), 1 x 2-hr exam (45%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will develop students' broad understanding of the different approaches to health (e.g. biomedical, psychological, sociological). This would include understanding the different factors which impact health; how different approaches may lead to different strategies for developing and evaluating health solutions; and different ways of measuring health. Students are then enabled to consider how these different approaches to health are reflected in health systems both locally and internationally. Students would explore the different healthcare systems and engage with current and future challenges for health systems and health policy in Australia and abroad.

Textbooks
Readings will be drawn from a variety of journals, government reports and textbooks. The reading list will be available to students through the unit of study outline and learning management system

HSBH1013
Society and Health

Credit points: 6 **Session:** Semester 2 **Classes:** 2-hr lecture/week, 1-hr tutorial/week **Assessment:** short answer assessments (30%), presentation (20%), 1 x 2-hr exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In considering how health is delivered, students will explore people involved in health. This includes the breadth of the health workforce (both paid and unpaid) and health consumers. Students will examine the social determinants of health and the meaning of health for different populations. Embedded in this unit will be considerations of ethics and legal concerns, cultural awareness and interdisciplinarity.

Textbooks
Readings will be drawn from a variety of journals, government reports and textbooks. The reading list will be available to students through the unit of study outline and learning management system.

2000-level units of study

Major Core

HSBH2007
Research Methods in Health

Credit points: 6 **Teacher/Coordinator:** Dr Rowena Forsyth **Session:** Semester 1 **Classes:** 1x2-hr lecture/week, 1x1-hr tutorial/week **Prerequisites:** HSBH1006 and HSBH1008 and HSBH1009 **Prohibitions:** BACH2140 or HSBH1007 **Assessment:** Written group assignment (30%), written individual assignment (20%), 1x2-hr exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit of study introduces students to the design and evaluation of research questions relating to health. Drawing on both qualitative and quantitative research methods, students will be introduced to key concepts relating to methodology; research design and research method.

HSBH2009
Innovations in eHealth

Credit points: 6 **Session:** Semester 2 **Classes:** 2-hr lecture/week, 1-hr tutorial/week **Prohibitions:** HSBH1010 **Assumed knowledge:** HSBH1012, HSBH1013 **Assessment:** reflection task (20%), health design project (30%), skills modules (10%), job application/eportfolio (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Digital technologies are changing the health landscape from consumers having access to Dr Google to clinicians using virtual reality as part of treatment. This unit of study explores the impact of digital technologies on our health and wellbeing and includes consideration of how these devices and software interact with the healthcare system, affect attitudes towards health and healthcare providers, and change the discussions about health ethics, and health equity. Students will engage in practical, hands-on learning experience and complete authentic assessments such as designing innovations, creating an ePortfolio, and applying for a job.

Textbooks

Readings will be drawn from a variety of journals, government reports, and textbooks. The reading list will be available to students through the unit of study outline and learning management system

3000-level units of study

Research units

HSBH3005
Evidence Based Health Care

Credit points: 6 **Teacher/Coordinator:** Dr Grace Spencer **Session:** Semester 2 **Classes:** 1x2-hr lecture/week, 1x1-hr tutorial/week **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** PICO framework (40%), critical apprisal essay (40%) and impact statement (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Evidence-based health care is the conscientious use of current best evidence in making decisions about the care of individuals or the delivery of health services. This unit will introduce you to evidence based health care by developing your understanding of knowledge and evidence, and critical appraisal skills to inform your decision making in health care policy and practice.

Textbooks

Hoffman, T., Bennett, S. and Del Mar, C. (2013). Evidence-based practice across the health professions (2nd ed.). Chatswood: Elsevier.

HSBH3018
Quantitative Research Methods in Health

Credit points: 6 **Teacher/Coordinator:** Dr Tatjana Seizova-Cajic **Session:** Semester 1 **Classes:** 1x2-hr lecture/week, 1x1-hr tutorial or laboratory session/week **Prerequisites:** HSBH1007 or HSBH2007 **Prohibitions:** PSYC2012 or SCLG3603 **Assessment:** Group presentation (10%), In-class quiz (20%), 1000wd report (20%) and end semester exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit teaches about the research process from development of a research question to study design, quantitative data analysis, and interpretation of outcomes in the context of theory and practical applications. You will learn about concepts and logic that apply to quantitative research in general, with an emphasis on issues and types of studies most relevant in health research. As either an individual or group exercise, you will perform most aspects of the research process using examples given to you or created by you, and will receive comprehensive feedback along the way. The unit will prepare you to critically evaluate research findings in your future career, and to engage in further research training should you wish to do so. Skills you are expected to develop include succinct academic writing, simple data analysis using SPSS, and developing ideas in the context of teamwork.

Textbooks

Field, A. (2013). Discovering statistics using IBM SPSS statistics: And sex, drugs and rock 'n' roll (4th ed.). Los Angeles: Sage.
Portney, L. G., and Watkins, M. P. (2009). Foundations of clinical research: Applications to practice (3rd ed.). Essex, England: Pearson Education Limited.

HSBH3019
Qualitative Research Methods in Health

Credit points: 6 **Teacher/Coordinator:** A/Prof Jennifer Smith-Merry **Session:** Semester 2 **Classes:** 1x2-hr Workshop/week, 1x1-hr tutorial/week **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Prohibitions:** SCLG2602 or BACH4056 **Assessment:** 750wd research report (20%),2000wd research report (50%) and end semester take-home exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study has three aims: to build on core units of study offered in First Year and Second Year to provide critical appraisal skills in reading and utilising qualitative research related to health behaviour and health care; to understand the theoretical orientation of contemporary qualitative health research methods; and to develop skills in undertaking qualitative research methods. With a focus on applying critical and theoretical knowledge, the unit has a practical orientation and students will gain experience in techniques of observation, document analysis, in-depth interviewing and focus group interviews.

HSBH3024
Designing a Research Project

Credit points: 6 **Teacher/Coordinator:** Dr Vanessa Lee **Session:** Semester 2 **Classes:** 1 x 2-hr workshop, and 1x1-hr online and practical activities/week **Prerequisites:** (HSBH1006 AND (HSBH1007 OR HSBH2007) AND HSBH1008 AND HSBH1009) OR ((BACH1161 OR HSBH1003) AND HSBH1007) **Assessment:** ethics assignment 1500 wds (30%), oral presentation (20%), research proposal 2000 wds (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to assist students understand the principles of writing a research proposal, applicable for either project planning or evaluation within health or for further research (e.g., Honours). Students will be introduced to the key components of preparing and writing up a proposal: purpose of the research and question(s) to be addressed; reviewing existing literature on the topic; deciding on a research methodology and methods used to collect data; proposing an approach for data analysis; identifying ethical issues and working through the process of applying for ethics approval; providing a clear plan and timeline for each stage of the research. At the completion of this unit, students will have undertaken an ethics application, planned, orally presented and written up a research proposal. This unit of study is recommended for students who wish to undertake Honours after completion of the pass degree.

Interdisciplinary project units

HSBH3003
Health Service Strategy and Policy

Credit points: 6 **Teacher/Coordinator:** A/Prof Kate O'Loughlin **Session:** Semester 2 **Classes:** 1x2-hr lectures/week, 1-hr tutorial/week **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** Tutorial activities (10%), online quizzes (15%), 2000wd report (35%) and 1.5hr exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study offers students an insight into the larger picture of how a nation sets priorities for health services. The importance of evidence-based health policy development in planning health services and strategies for increasing the cost-effectiveness of delivering health services will be covered. Students will gain skills in health service needs assessment, measuring cost-effectiveness, macroeconomic evaluation of health services and systems, and health equity assessment. It is envisaged that students will develop a capacity to understand the concept of health policy and its relevance to the delivery of health care services and to take a problem-oriented approach to analysing and evaluating current policy provisions and strategies in the Australian context.

HSBH3004
Health, Ethics and the Law

Credit points: 6 **Teacher/Coordinator:** A/Prof Jennifer Smith-Merry **Session:** Semester 1 **Classes:** 1x2-hr lectures/week, 1-hr tutorial/week **Prerequisites:** 48 credit points of units **Assessment:** Mid-semester exam (20%), research report (40%) and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study focuses on ethics and law in relation to the Australian health system. Fundamental ethical principles applied to ethical issues in health and health research are covered. Medico-legal aspects of health and health services will be explored. Particular areas of focus include mental health, health complaints, reproductive technologies, the start and end of life, disability, public health and genetic technology. Students will develop their own ethical thinking and an understanding of professionally acceptable behaviours appropriate to practice in a wide range of health professions. Learning is interactive and scenarios are used to develop ethical thinking. Students get to write a research report on an ethical and legal issue of their choosing.

Textbooks

Kerridge, I., Lowe, M., and Stewart, C. (2013). Ethics and law for the health professions. Leichardt: The Federation Press.

HSBH3011
Rural Health

Credit points: 6 **Teacher/Coordinator:** Dr Krestina Amon **Session:** Semester 1 **Classes:** Distance education/intensive on-campus mode. Web-based learning, Week 1 lecture (2hrs) on campus with mandatory attendance. All other materials asynchronous online. **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** Attendance at timetabled lecture and online participation (25%), group assignment 3000 words (30%), individual research assignment 2000 words (45%) **Mode of delivery:** Distance education/intensive on campus

This unit introduces students to a range of practice and research issues in rural health care. Topics covered include: the nature and variety of rural settings; special populations and cultural safety; rural health needs and access to health services; relevant models of health service delivery; and the rural health workforce and inter-professional practice.

HSBH3012
FHS Abroad

Credit points: 6 **Teacher/Coordinator:** Dr Elizabeth Dylke **Session:** Semester 1, Semester 2 **Classes:** Full-day briefing session, half-day debriefing session. **Prerequisites:** Successful completion of all 1st year units in an undergraduate FHS degree **Assessment:** Pre-departure research (30%), field diary (20%), report (40%) and presentation (10%). **Practical field work:** 4-6 weeks working with a community-based organisation in a developing country. **Mode of delivery:** Field experience

Note: Students interested in participating must obtain permission from their course director before enrolling in FHS Abroad. Some degrees require participants have a minimum credit average.

Cultural practices, disease patterns and healthcare systems are vastly different in different countries around the globe. This unit provides students with the opportunity to gain international experience in a health services setting in a developing country. Students will participate in a 4-6 week health or care placement with a community-based organisation in South or Southeast Asia. Countries where students can be placed include Vietnam, Cambodia, India and the Philippines. As part of the unit, you will be expected to participate in local development programs, live within the community that you are visiting, and document and reflect on key health and development issues facing local populations. The unit will require you to demonstrate cultural sensitivity and an ability to adapt to new environments, a capacity for critical reflection and awareness of complex global health and development issues.

HSBH3013
FHS Indigenous Communities

Credit points: 6 **Teacher/Coordinator:** Dr Josephine Gwynn **Session:** Semester 2 **Classes:** 1x2-hr introduction session (to be completed before enrolment), 5x2-hr workshops,1x2-hr debriefing session, and online learning activities **Prerequisites:** Successful completion of all 1st year units in an undergraduate FHS degree **Assessment:** Pre-fieldwork preparation paper 1000wd (30%), participation and contribution to on-line learning activities and discussion (10%), Fieldwork critical reflection report (60%) **Practical field work:** approximately 4 weeks working in an Indigenous community **Mode of delivery:** Field experience

This unit provides theoretical and practical knowledge about relevant models of community development in Aboriginal communities in New South Wales. Students will gain experience in working with Aboriginal communities in a health services setting, participating in an approximately 4 week placement in a local Aboriginal community. Students participate in a community identified development project and will document and report on their experiences in working with the local Aboriginal community. Students will be required to demonstrate project management skills including time management and reporting abilities. Students are required to attend briefing and debriefing activities and complete on-line learning activities in addition to their field experience.

HSBH3016
Individual and Societal Ageing

Credit points: 6 **Teacher/Coordinator:** A/Prof Kate O'Loughlin **Session:** Semester 2 **Classes:** 2x1-hr lecture, 1x1-hr tutorial/week **Prerequisites:** BACH1161 or HSBH1003 or HSBH1008 **Assessment:** 1500wd essay (30%), tutorial and online activities (30%) and 1hr exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Bachelor of Health Sciences students must have completed 24 credit points of HSBH junior units for enrolment into this unit. All other students must have completed 48 credit points.

This unit offers students an insight into the challenges and opportunities associated with population ageing and what is required to meet the needs of the increasing numbers of older people and those who will interact with them. It addresses the social and individual dimensions of ageing, health and well-being and the transitions that occur in later life. There will be an emphasis on the policy and practice implications of an ageing society and the role of various public and private providers (government, health care practitioners, family, voluntary) in providing services and care to older people. Students will be expected to develop a critical understanding of the issues related to ageing and the life course and gain an understanding of initiatives and policy debates relating to population ageing and quality of life of older people, their families and carers.

REHB3064
Alcohol and Drug Misuse Rehabilitation

Credit points: 6 **Teacher/Coordinator:** Dr Rodd Rothwell **Session:** Semester 1 **Classes:** Online **Prerequisites:** (HSBH1006, (HSBH1007 or HSBH2007), HSBH1008, HSBH1009) or 48 credit points of previous study. **Prohibitions:** REHB3061 **Assessment:** Short answer test (20%), Essay 2500 words (40%), 2 x online MCQ tests (40%) **Mode of delivery:** Distance education

Note: Students must have completed 48 credit points to enrol in this unit

This unit introduces students to issues relating to a major public health problem: the misuse of alcohol and other addictive drugs. The unit introduces students to two major aspects of this area: issues relating to the development of health prevention/health promotion policy, covering the philosophies of harm minimisation and zero tolerance; approaches to rehabilitation and treatment of those overusing both alcohol and other drugs. The unit commences with an analysis of public health policy approaches to the rehabilitation and treatment of people overusing alcohol and other harmful drugs. Students will be required to undertake an exercise involving an analysis of the effectiveness of the two major policy approaches to the problem of drug overuse and abuse: harm reduction and zero tolerance. They will be required to examine the evidence supporting these two approaches to public health policy. In the second part of the unit students will study the major therapeutic approaches to treatment and rehabilitation. This will include familiarisation with Alcoholics Anonymous, clinically based approaches including transactional analysis and other group therapy oriented approaches, the various behavioural therapies, therapeutic communities, methadone maintenance, needle exchange and recent trails in safe injection facilities. They will become familiar with the nature of services offered, the role of the various health professionals in these services and the nature of effective treatment and rehabilitation outcomes.

HSBH3026 to be developed for offering in 2019.

Disciplinary project units

HSBH3001
Health and Indigenous Populations

Credit points: 6 **Teacher/Coordinator:** Dr Vanessa Lee **Session:** Semester 1, Semester 2 **Classes:** 1x2-hr lecture/week, 1x1-hr tutorial/week. **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009) or (BACH1161 or HSBH1003) **Assessment:** On line quizzes (20%), Case study report 1500wd (40%), Critique diary 1500wd (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit of study is to provide students with the necessary tools to work with Aboriginal and Torres Strait Islander people and communities for equitable health service delivery. It explores the post-colonial impact and the policies that have contibuted to the adverse health outcomes that we see in the Aboriginal and Torres Strait Islander population of contemporary Australia today. The unit of study will also provide students with avenues of Best Practice in closing the gap between Indigenous and non-Indigenous people, for effective health service delivery.

HSBH3003
Health Service Strategy and Policy

Credit points: 6 **Teacher/Coordinator:** A/Prof Kate O'Loughlin **Session:** Semester 2 **Classes:** 1x2-hr lectures/week, 1-hr tutorial/week **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** Tutorial activities (10%), online quizzes (15%), 2000wd report (35%) and 1.5hr exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study offers students an insight into the larger picture of how a nation sets priorities for health services. The importance of evidence-based health policy development in planning health services and strategies for increasing the cost-effectiveness of delivering health services will be covered. Students will gain skills in health service needs assessment, measuring cost-effectiveness, macroeconomic evaluation of health services and systems, and health equity assessment. It is envisaged that students will develop a capacity to understand the concept of health policy and its relevance to the delivery of health care services and to take a problem-oriented approach to analysing and evaluating current policy provisions and strategies in the Australian context.

HSBH3004
Health, Ethics and the Law

Credit points: 6 **Teacher/Coordinator:** A/Prof Jennifer Smith-Merry **Session:** Semester 1 **Classes:** 1x2-hr lectures/week, 1-hr tutorial/week **Prerequisites:** 48 credit points of units **Assessment:** Mid-semester exam (20%), research report (40%) and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study focuses on ethics and law in relation to the Australian health system. Fundamental ethical principles applied to ethical issues in health and health research are covered. Medico-legal aspects of health and health services will be explored. Particular areas of focus include mental health, health complaints, reproductive technologies, the start and end of life, disability, public health and genetic technology. Students will develop their own ethical thinking and an understanding of professionally acceptable behaviours appropriate to practice in a wide range of health professions. Learning is interactive and scenarios are used to develop ethical thinking. Students get to write a research report on an ethical and legal issue of their choosing.

Textbooks

Kerridge, I., Lowe, M., and Stewart, C. (2013). Ethics and law for the health professions. Leichardt: The Federation Press.

HSBH3009
International Health

Credit points: 6 **Teacher/Coordinator:** Dr Zakia Hossain **Session:** Semester 2 **Classes:** 1x2-hour lecture/week, 1x1-hr face-to-face/on-line tutorial/week **Prerequisites:** 48 credit points of units **Prohibitions:** BACH3128 **Assessment:** Online activities (Blog and MCQs) (40%); Tutorial attendance and presentation (20%); and Briefing Paper 1500wd (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines theoretical and practical issues confronting global health professionals and practitioners, especially in low resource settings. The unit introduces students to: a) historical, political and economic forces that influence the health of populations around the world and contribute to international health inequities; b) global health crisis (emerging infectious disease; chronic disease and disability) facing both developed and developing countries and its impact; and, c) international health practices, including key actors and initiatives, as well as challenges and strategies for working in post-colonial and cross-cultural contexts. The unit provides students with an understanding of health determinants and interventions in international contexts, with a particular emphasis on low-resource settings. Examples of topics covered include health, poverty and inequality, globalisation and trade, foreign aid and development assistance. The unit also provides an introductory overview of contemporary international health challenges such as food security, humanitarian crises and climate change. Students will undertake an in-depth study of a global health issue, exploring the context in which it emerged and the forces that propel it, and advocate for actions to improve the issue in a specific local context and population group.

HSBH3011
Rural Health

Credit points: 6 **Teacher/Coordinator:** Dr Krestina Amon **Session:** Semester 1 **Classes:** Distance education/intensive on-campus mode. Web-based learning, Week 1 lecture (2hrs) on campus with mandatory attendance. All other materials asynchronous online. **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** Attendance at timetabled lecture and online participation (25%), group assignment 3000 words (30%), individual research assignment 2000 words (45%) **Mode of delivery:** Distance education/intensive on campus

This unit introduces students to a range of practice and research issues in rural health care. Topics covered include: the nature and variety of rural settings; special populations and cultural safety; rural health needs and access to health services; relevant models of health service delivery; and the rural health workforce and inter-professional practice.

HSBH3012
FHS Abroad

Credit points: 6 **Teacher/Coordinator:** Dr Elizabeth Dylke **Session:** Semester 1, Semester 2 **Classes:** Full-day briefing session, half-day debriefing session. **Prerequisites:** Successful completion of all 1st year units in an undergraduate FHS degree **Assessment:** Pre-departure research (30%), field diary (20%), report (40%) and presentation (10%). **Practical field work:** 4-6 weeks working with a community-based organisation in a developing country. **Mode of delivery:** Field experience

Note: Students interested in participating must obtain permission from their course director before enrolling in FHS Abroad. Some degrees require participants have a minimum credit average.

Cultural practices, disease patterns and healthcare systems are vastly different in different countries around the globe. This unit provides students with the opportunity to gain international experience in a health services setting in a developing country. Students will participate in a 4-6 week health or care placement with a community-based organisation in South or Southeast Asia. Countries where students can be placed include Vietnam, Cambodia, India and the Philippines. As part of the unit, you will be expected to participate in local development programs, live within the community that you are visiting, and document and reflect on key health and development issues facing local populations. The unit will require you to demonstrate cultural sensitivity and an ability to adapt to new environments, a capacity for critical reflection and awareness of complex global health and development issues.

HSBH3013
FHS Indigenous Communities

Credit points: 6 **Teacher/Coordinator:** Dr Josephine Gwynn **Session:** Semester 2 **Classes:** 1x2-hr introduction session (to be completed before enrolment), 5x2-hr workshops,1x2-hr debriefing session, and online learning activities **Prerequisites:** Successful completion of all 1st year units in an undergraduate FHS degree **Assessment:** Pre-fieldwork preparation paper 1000wd (30%), participation and contribution to on-line learning activities and discussion (10%), Fieldwork critical reflection report (60%) **Practical field work:** approximately 4 weeks working in an Indigenous community **Mode of delivery:** Field experience

This unit provides theoretical and practical knowledge about relevant models of community development in Aboriginal communities in New South Wales. Students will gain experience in working with Aboriginal communities in a health services setting, participating in an approximately 4 week placement in a local Aboriginal community. Students participate in a community identified development project and will document and report on their experiences in working with the local Aboriginal community. Students will be required to demonstrate project management skills including time management and reporting abilities. Students are required to attend briefing and debriefing activities and complete on-line learning activities in addition to their field experience.

HSBH3015
Mental Health Rehabilitation

Credit points: 6 **Teacher/Coordinator:** A/Prof Lynda Matthews **Session:** Semester 1 **Classes:** Online **Prerequisites:** (HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009) or (48 credit points of previous study with a miminum of 24 from Intermediate units of study) **Assessment:** 2x online assessments (20%) ,1x2000wd essay (50%) and participation (30%) **Mode of delivery:** Online

Note: Students must have completed at least 48 credit points to enrol in this UoS

Poor mental health poses a major challenge to our society, and health care professionals, among others, are charged with 'making a difference'. To do so, they need to be equipped with the most up-to-date knowledge of effective mental health approaches and interventions. This unit will overview major mental health conditions and significant social, philosophical, and historical influences on health care service delivery and reform to provide a context for contemporary rehabilitation practice. Students will be introduced to the goals, values and guiding principles of psychiatric rehabilitation and to practices that aim to address the culture of stigma and low expectations by society of people with mental health conditions. Rehabilitation interventions that have demonstrated efficacy in promoting recovery by reducing obstacles to participation for people with mental health conditions will be examined. Local and international research underpinning best practice in rehabilitation management and service delivery will be reviewed and consumer perspectives and experiences explored.

HSBH3016
Individual and Societal Ageing

Credit points: 6 **Teacher/Coordinator:** A/Prof Kate O'Loughlin **Session:** Semester 2 **Classes:** 2x1-hr lecture, 1x1-hr tutorial/week **Prerequisites:** BACH1161 or HSBH1003 or HSBH1008 **Assessment:** 1500wd essay (30%), tutorial and online activities (30%) and 1hr exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Bachelor of Health Sciences students must have completed 24 credit points of HSBH junior units for enrolment into this unit. All other students must have completed 48 credit points.

This unit offers students an insight into the challenges and opportunities associated with population ageing and what is required to meet the needs of the increasing numbers of older people and those who will interact with them. It addresses the social and individual dimensions of ageing, health and well-being and the transitions that occur in later life. There will be an emphasis on the policy and practice implications of an ageing society and the role of various public and private providers (government, health care practitioners, family, voluntary) in providing services and care to older people. Students will be expected to develop a critical understanding of the issues related to ageing and the life course and gain an understanding of initiatives and policy debates relating to population ageing and quality of life of older people, their families and carers.

HSBH3018
Quantitative Research Methods in Health

Credit points: 6 **Teacher/Coordinator:** Dr Tatjana Seizova-Cajic **Session:** Semester 1 **Classes:** 1x2-hr lecture/week, 1x1-hr tutorial or laboratory session/week **Prerequisites:** HSBH1007 or HSBH2007 **Prohibitions:** PSYC2012 or SCLG3603 **Assessment:** Group presentation (10%), In-class quiz (20%), 1000wd report (20%) and end semester exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit teaches about the research process from development of a research question to study design, quantitative data analysis, and interpretation of outcomes in the context of theory and practical applications. You will learn about concepts and logic that apply to quantitative research in general, with an emphasis on issues and types of studies most relevant in health research. As either an individual or group exercise, you will perform most aspects of the research process using examples given to you or created by you, and will receive comprehensive feedback along the way. The unit will prepare you to critically evaluate research findings in your future career, and to engage in further research training should you wish to do so. Skills you are expected to develop include succinct academic writing, simple data analysis using SPSS, and developing ideas in the context of teamwork.

Textbooks

Field, A. (2013). Discovering statistics using IBM SPSS statistics: And sex, drugs and rock 'n' roll (4th ed.). Los Angeles: Sage.

Portney, L. G., and Watkins, M. P. (2009). Foundations of clinical research: Applications to practice (3rd ed.). Essex, England: Pearson Education Limited.

HSBH3022
Health Promotion: Principles and Practice

Credit points: 6 **Teacher/Coordinator:** Dr Justin McNab **Session:** Semester 1 **Classes:** 1x2-hr workshop/week **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** 1x1500wd essay (40%), 1x 15 min group oral presentation (10%) and 1x 2000wd project plan (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces students to the key theories, principles and frameworks underpinning health promotion. Students will critically examine individual and socio-ecological approaches, models of community participation, and settings approaches. Students will develop an appreciation that effective health promotion involves actions that are aimed, not only at increasing the knowledge and skills of individuals, but also actions to strengthen community action and to create living and working environments that support health. Students will develop knowledge in the application of health promotion programs in diverse populations and settings, including Indigenous, culturally and linguistically diverse (CALD) and rural groups. Students will consider how health promotion fits within the broader health context, and the ways in which health promotion practitioners work collaboratively with communities, work places, schools, government and other health professionals to improve the health of populations. The theoretical and applied skills that students develop will prepare students for careers in health promotion practice and research.

HSBH3023
BHS Work Integrated Learning Placement

Credit points: 6 **Teacher/Coordinator:** Dr Elizabeth Bourne **Session:** Semester 2 **Classes:** 1 full day workshop prior to and 1 full day workshop at end of placement; online and/or face to face tutorial support during placement **Prerequisites:** (BIOL1001 OR BIOL1003) AND (PSYC1001 OR PSYC1002) AND at least 12cp from the list of BHlthSci senior units of study AND at least 24cp of units of study from the second major **Prohibitions:** HSBH3012, HSBH3013, CSCD3090 **Assumed knowledge:** Introductory neuroscience **Assessment:** compliance checking (pass/fail); attendance at briefing and debriefing activities (pass/fail); attendance at 10 full days or 20 half days of placement (pass/fail); project plan (10%); on-line forum (10%); reflective report (10%); project report (50%); presentation (10%); and supervisorÂ¿s evaluation (10%) **Practical field work:** work integrated learning placement (1 day/week or 2 half-days/week for 10 weeks, negotiated with the placement site) **Mode of delivery:** Professional practice

Note: Eligible students will require permission from the Course Director to enrol in this unit of study. Enrolment will be subject to availability of suitable placements.

This Work Integrated Learning placement will be offered to high achieving BHthSci students (other than students doing the Hearing and Speech major or the BHS/MNursing dual degree) and will take place in settings aligned with their second major. The placement will be preceded and concluded by briefing and debriefing workshops on campus, with the placement occurring part-time over a maximum of 10 weeks in university approved workplaces. Learning activities and assessment tasks will support the development of graduate attributes, work-readiness and employability skills for students.

HSBH3024
Designing a Research Project

Credit points: 6 **Teacher/Coordinator:** Dr Vanessa Lee **Session:** Semester 2 **Classes:** 1 x 2-hr workshop, and 1x1-hr online and practical activities/week **Prerequisites:** (HSBH1006 AND (HSBH1007 OR HSBH2007) AND HSBH1008 AND HSBH1009) OR ((BACH1161 OR HSBH1003) AND HSBH1007) **Assessment:** ethics assignment 1500 wds (30%), oral presentation (20%), research proposal 2000 wds (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to assist students understand the principles of writing a research proposal, applicable for either project planning or evaluation within health or for further research (e.g., Honours). Students will be introduced to the key components of preparing and writing up a proposal: purpose of the research and question(s) to be addressed; reviewing existing literature on the topic; deciding on a research methodology and methods used to collect data; proposing an approach for data analysis; identifying ethical issues and working through the process of applying for ethics approval; providing a clear plan and timeline for each stage of the research. At the completion of this unit, students will have undertaken an ethics application, planned, orally presented and written up a research proposal. This unit of study is recommended for students who wish to undertake Honours after completion of the pass degree.

Selective

HSBH3001
Health and Indigenous Populations

Credit points: 6 **Teacher/Coordinator:** Dr Vanessa Lee **Session:** Semester 1, Semester 2 **Classes:** 1x2-hr lecture/week, 1x1-hr tutorial/week. **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009) or (BACH1161 or HSBH1003) **Assessment:** On line quizzes (20%), Case study report 1500wd (40%), Critique diary 1500wd (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit of study is to provide students with the necessary tools to work with Aboriginal and Torres Strait Islander people and communities for equitable health service delivery. It explores the post-colonial impact and the policies that have contibuted to the adverse health outcomes that we see in the Aboriginal and Torres Strait Islander population of contemporary Australia today. The unit of study will also provide students with avenues of Best Practice in closing the gap between Indigenous and non-Indigenous people, for effective health service delivery.

HSBH3003
Health Service Strategy and Policy

Credit points: 6 **Teacher/Coordinator:** A/Prof Kate O'Loughlin **Session:** Semester 2 **Classes:** 1x2-hr lectures/week, 1-hr tutorial/week **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** Tutorial activities (10%), online quizzes (15%), 2000wd report (35%) and 1.5hr exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study offers students an insight into the larger picture of how a nation sets priorities for health services. The importance of evidence-based health policy development in planning health services and strategies for increasing the cost-effectiveness of delivering health services will be covered. Students will gain skills in health service needs assessment, measuring cost-effectiveness, macroeconomic evaluation of health services and systems, and health equity assessment. It is envisaged that students will develop a capacity to understand the concept of health policy and its relevance to the delivery of health care services and to take a problem-oriented approach to analysing and evaluating current policy provisions and strategies in the Australian context.

HSBH3004
Health, Ethics and the Law

Credit points: 6 **Teacher/Coordinator:** A/Prof Jennifer Smith-Merry **Session:** Semester 1 **Classes:** 1x2-hr lectures/week, 1-hr tutorial/week **Prerequisites:** 48 credit points of units **Assessment:** Mid-semester exam (20%), research report (40%) and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study focuses on ethics and law in relation to the Australian health system. Fundamental ethical principles applied to ethical issues in health and health research are covered. Medico-legal aspects of health and health services will be explored. Particular areas of focus include mental health, health complaints, reproductive technologies, the start and end of life, disability, public health and genetic technology. Students will develop their own ethical thinking and an understanding of professionally acceptable behaviours appropriate to practice in a wide range of health professions. Learning is interactive and scenarios are used to develop ethical thinking. Students get to write a research report on an ethical and legal issue of their choosing.

Textbooks

Kerridge, I., Lowe, M., and Stewart, C. (2013). Ethics and law for the health professions. Leichardt: The Federation Press.

HSBH3005
Evidence Based Health Care

Credit points: 6 **Teacher/Coordinator:** Dr Grace Spencer **Session:** Semester 2 **Classes:** 1x2-hr lecture/week, 1x1-hr tutorial/week **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** PICO framework (40%), critical apprisal essay (40%) and impact statement (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Evidence-based health care is the conscientious use of current best evidence in making decisions about the care of individuals or the delivery of health services. This unit will introduce you to evidence based health care by developing your understanding of knowledge and evidence, and critical appraisal skills to inform your decision making in health care policy and practice.

Textbooks

Hoffman, T., Bennett, S. and Del Mar, C. (2013). Evidence-based practice across the health professions (2nd ed.). Chatswood: Elsevier.

HSBH3009
International Health

Credit points: 6 **Teacher/Coordinator:** Dr Zakia Hossain **Session:** Semester 2 **Classes:** 1x2-hour lecture/week, 1x1-hr face-to-face/on-line tutorial/week **Prerequisites:** 48 credit points of units **Prohibitions:** BACH3128 **Assessment:** Online activities (Blog and MCQs) (40%); Tutorial attendance and presentation (20%); and Briefing Paper 1500wd (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines theoretical and practical issues confronting global health professionals and practitioners, especially in low resource settings. The unit introduces students to: a) historical, political and economic forces that influence the health of populations around the world and contribute to international health inequities; b) global health crisis (emerging infectious disease; chronic disease and disability) facing both developed and developing countries and its impact; and, c) international health practices, including key actors and initiatives, as well as challenges and strategies for working in post-colonial and cross-cultural contexts. The unit provides students with an understanding of health determinants and interventions in international contexts, with a particular emphasis on low-resource settings. Examples of topics covered include health, poverty and inequality, globalisation and trade, foreign aid and development assistance. The unit also provides an introductory overview of contemporary international health challenges such as food security, humanitarian crises and climate change. Students will undertake an in-depth study of a global health issue, exploring the context in which it emerged and the forces that propel it, and advocate for actions to improve the issue in a specific local context and population group.

HSBH3010
Health and Lifelong Disability

Credit points: 6 **Teacher/Coordinator:** Dr Zakia Hossain **Session:** Semester 2 **Classes:** 1x2-hr lecture/week, 1x1-hr tutorial/week. **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** Tutorial activities(20%), essay 2000wd (35%) and case study (45%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study explores the roles and responsibilities of health professionals who work with children, adolescents and adults with lifelong disabilities, and their families. Using an inter-professional case-based curriculum, students will examine the nature of lifelong disability; factors which affect the participation of persons with lifelong disability in everyday life activities including education, leisure, and employment; and strategies for increasing their participation in these activities. Students will be supported to critique research literature, to examine the roles and responsibilities of allied health professionals in the context of working with persons with lifelong disability, and to develop practical strategies for interacting and working collaboratively and successfully with children, adolescents, and adults with lifelong disabilities, their families and fellow professionals. It is expected that through a combination of face-to-face teaching and online learning activities, this unit will assist students in preparing to work with individuals with lifelong disabilities in a range of workplace settings.

HSBH3011
Rural Health

Credit points: 6 **Teacher/Coordinator:** Dr Krestina Amon **Session:** Semester 1 **Classes:** Distance education/intensive on-campus mode. Web-based learning, Week 1 lecture (2hrs) on campus with mandatory attendance. All other materials asynchronous online. **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** Attendance at timetabled lecture and online participation (25%), group assignment 3000 words (30%), individual research assignment 2000 words (45%) **Mode of delivery:** Distance education/intensive on campus

This unit introduces students to a range of practice and research issues in rural health care. Topics covered include: the nature and variety of rural settings; special populations and cultural safety; rural health needs and access to health services; relevant models of health service delivery; and the rural health workforce and inter-professional practice.

HSBH3012
FHS Abroad

Credit points: 6 **Teacher/Coordinator:** Dr Elizabeth Dylke **Session:** Semester 1, Semester 2 **Classes:** Full-day briefing session, half-day debriefing session. **Prerequisites:** Successful completion of all 1st year units in an undergraduate FHS degree **Assessment:** Pre-departure research (30%), field diary (20%), report (40%) and presentation (10%). **Practical field work:** 4-6 weeks working with a community-based organisation in a developing country. **Mode of delivery:** Field experience

Note: Students interested in participating must obtain permission from their course director before enrolling in FHS Abroad. Some degrees require participants have a minimum credit average.

Cultural practices, disease patterns and healthcare systems are vastly different in different countries around the globe. This unit provides students with the opportunity to gain international experience in a health services setting in a developing country. Students will participate in a 4-6 week health or care placement with a community-based organisation in South or Southeast Asia. Countries where students can be placed include Vietnam, Cambodia, India and the Philippines. As part of the unit, you will be expected to participate in local development programs, live within the community that you are visiting, and document and reflect on key health and development issues facing local populations. The unit will require you to demonstrate cultural sensitivity and an ability to adapt to new environments, a capacity for critical reflection and awareness of complex global health and development issues.

HSBH3013
FHS Indigenous Communities

Credit points: 6 **Teacher/Coordinator:** Dr Josephine Gwynn **Session:** Semester 2 **Classes:** 1x2-hr introduction session (to be completed before enrolment), 5x2-hr workshops,1x2-hr debriefing session, and online learning activities **Prerequisites:** Successful completion of all 1st year units in an undergraduate FHS degree **Assessment:** Pre-fieldwork preparation paper 1000wd (30%), participation and contribution to on-line learning activities and discussion (10%), Fieldwork critical reflection report (60%) **Practical field work:** approximately 4 weeks working in an Indigenous community **Mode of delivery:** Field experience

This unit provides theoretical and practical knowledge about relevant models of community development in Aboriginal communities in New South Wales. Students will gain experience in working with Aboriginal communities in a health services setting, participating in an approximately 4 week placement in a local Aboriginal community. Students participate in a community identified development project and will document and report on their experiences in working with the local Aboriginal community. Students will be required to demonstrate project management skills including time management and reporting abilities. Students are required to attend briefing and debriefing activities and complete on-line learning activities in addition to their field experience.

HSBH3015
Mental Health Rehabilitation

Credit points: 6 **Teacher/Coordinator:** A/Prof Lynda Matthews **Session:** Semester 1 **Classes:** Online **Prerequisites:** (HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009) or (48 credit points of previous study with a miminum of 24 from Intermediate units of study) **Assessment:** 2x online assessments (20%) ,1x2000wd essay (50%) and participation (30%) **Mode of delivery:** Online

Note: Students must have completed at least 48 credit points to enrol in this UoS

Poor mental health poses a major challenge to our society, and health care professionals, among others, are charged with 'making a difference'. To do so, they need to be equipped with the most up-to-date knowledge of effective mental health approaches and interventions. This unit will overview major mental health conditions and significant social, philosophical, and historical influences on health care service delivery and reform to provide a context for contemporary rehabilitation practice. Students will be introduced to the goals, values and guiding principles of psychiatric rehabilitation and to practices that aim to address the culture of stigma and low expectations by society of people with mental health conditions. Rehabilitation interventions that have demonstrated efficacy in promoting recovery by reducing obstacles to participation for people with mental health conditions will be examined. Local and international research underpinning best practice in rehabilitation management and service delivery will be reviewed and consumer perspectives and experiences explored.

HSBH3016
Individual and Societal Ageing

Credit points: 6 **Teacher/Coordinator:** A/Prof Kate O'Loughlin **Session:** Semester 2 **Classes:** 2x1-hr lecture, 1x1-hr tutorial/week **Prerequisites:** BACH1161 or HSBH1003 or HSBH1008 **Assessment:** 1500wd essay (30%), tutorial and online activities (30%) and 1hr exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Bachelor of Health Sciences students must have completed 24 credit points of HSBH junior units for enrolment into this unit. All other students must have completed 48 credit points.

This unit offers students an insight into the challenges and opportunities associated with population ageing and what is required to meet the needs of the increasing numbers of older people and those who will interact with them. It addresses the social and individual dimensions of ageing, health and well-being and the transitions that occur in later life. There will be an emphasis on the policy and practice implications of an ageing society and the role of various public and private providers (government, health care practitioners, family, voluntary) in providing services and care to older people. Students will be expected to develop a critical understanding of the issues related to ageing and the life course and gain an understanding of initiatives and policy debates relating to population ageing and quality of life of older people, their families and carers.

HSBH3018
Quantitative Research Methods in Health

Credit points: 6 **Teacher/Coordinator:** Dr Tatjana Seizova-Cajic **Session:** Semester 1 **Classes:** 1x2-hr lecture/week, 1x1-hr tutorial or laboratory session/week **Prerequisites:** HSBH1007 or HSBH2007 **Prohibitions:** PSYC2012 or SCLG3603 **Assessment:** Group presentation (10%), In-class quiz (20%), 1000wd report (20%) and end semester exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit teaches about the research process from development of a research question to study design, quantitative data analysis, and interpretation of outcomes in the context of theory and practical applications. You will learn about concepts and logic that apply to quantitative research in general, with an emphasis on issues and types of studies most relevant in health research. As either an individual or group exercise, you will perform most aspects of the research process using examples given to you or created by you, and will receive comprehensive feedback along the way. The unit will prepare you to critically evaluate research findings in your future career, and to engage in further research training should you wish to do so. Skills you are expected to develop include succinct academic writing, simple data analysis using SPSS, and developing ideas in the context of teamwork.

Textbooks

Field, A. (2013). Discovering statistics using IBM SPSS statistics: And sex, drugs and rock 'n' roll (4th ed.). Los Angeles: Sage.
Portney, L. G., and Watkins, M. P. (2009). Foundations of clinical research: Applications to practice (3rd ed.). Essex, England: Pearson Education Limited.

HSBH3019
Qualitative Research Methods in Health

Credit points: 6 **Teacher/Coordinator:** A/Prof Jennifer Smith-Merry **Session:** Semester 2 **Classes:** 1x2-hr Workshop/week, 1x1-hr tutorial/week **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Prohibitions:** SCLG2602 or BACH4056 **Assessment:** 750wd research report (20%),2000wd research report (50%) and end semester take-home exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study has three aims: to build on core units of study offered in First Year and Second Year to provide critical appraisal skills in reading and utilising qualitative research related to health behaviour and health care; to understand the theoretical orientation of contemporary qualitative health research methods; and to develop skills in undertaking qualitative research methods. With a focus on applying critical and theoretical knowledge, the unit has a practical orientation and students will gain experience in techniques of observation, document analysis, in-depth interviewing and focus group interviews.

HSBH3022
Health Promotion: Principles and Practice

Credit points: 6 **Teacher/Coordinator:** Dr Justin McNab **Session:** Semester 1 **Classes:** 1x2-hr workshop/week **Prerequisites:** HSBH1006 and (HSBH1007 or HSBH2007) and HSBH1008 and HSBH1009 **Assessment:** 1x1500wd essay (40%), 1x 15 min group oral presentation (10%) and 1x 2000wd project plan (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces students to the key theories, principles and frameworks underpinning health promotion. Students will critically examine individual and socio-ecological approaches, models of community participation, and settings approaches. Students will develop an appreciation that effective health promotion involves actions that are aimed, not only at increasing the knowledge and skills of individuals, but also actions to strengthen community action and to create living and working environments that support health. Students will develop knowledge in the application of health promotion programs in diverse populations and settings, including Indigenous, culturally and linguistically diverse (CALD) and rural groups. Students will consider how health promotion fits within the broader health context, and the ways in which health promotion practitioners work collaboratively with communities, work places, schools, government and other health professionals to improve the health of populations. The theoretical and applied skills that students develop will prepare students for careers in health promotion practice and research.

HSBH3023
BHS Work Integrated Learning Placement

Credit points: 6 **Teacher/Coordinator:** Dr Elizabeth Bourne **Session:** Semester 2 **Classes:** 1 full day workshop prior to and 1 full day workshop at end of placement; online and/or face to face tutorial support during placement **Prerequisites:** (BIOL1001 OR BIOL1003) AND (PSYC1001 OR PSYC1002) AND at least 12cp from the list of BHlthSci senior units of study AND at least 24cp of units of study from the second major **Prohibitions:** HSBH3012, HSBH3013, CSCD3090 **Assumed knowledge:** Introductory neuroscience **Assessment:** compliance checking (pass/fail); attendance at briefing and debriefing activities (pass/fail); attendance at 10 full days or 20 half days of placement (pass/fail); project plan (10%); on-line forum (10%); reflective report (10%); project report (50%); presentation (10%); and supervisorÂ¿s evaluation (10%) **Practical field work:** work integrated learning placement (1 day/week or 2 half-days/week for 10 weeks, negotiated with the placement site) **Mode of delivery:** Professional practice

Note: Eligible students will require permission from the Course Director to enrol in this unit of study. Enrolment will be subject to availability of suitable placements.

This Work Integrated Learning placement will be offered to high achieving BHthSci students (other than students doing the Hearing and Speech major or the BHS/MNursing dual degree) and will take place in settings aligned with their second major. The placement will be preceded and concluded by briefing and debriefing workshops on campus, with the placement occurring part-time over a maximum of 10 weeks in university approved workplaces. Learning activities and assessment tasks will support the development of graduate attributes, work-readiness and employability skills for students.

HSBH3024
Designing a Research Project

Credit points: 6 **Teacher/Coordinator:** Dr Vanessa Lee **Session:** Semester 2 **Classes:** 1 x 2-hr workshop, and 1x1-hr online and practical activities/week **Prerequisites:** (HSBH1006 AND (HSBH1007 OR HSBH2007) AND HSBH1008 AND HSBH1009) OR ((BACH1161 OR HSBH1003) AND HSBH1007) **Assessment:** ethics assignment 1500 wds (30%), oral presentation (20%), research proposal 2000 wds (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to assist students understand the principles of writing a research proposal, applicable for either project planning or evaluation within health or for further research (e.g., Honours). Students will be introduced to the key components of preparing and writing up a proposal: purpose of the research and question(s) to be addressed; reviewing existing literature on the topic; deciding on a research methodology and methods used to collect data; proposing an approach for data analysis; identifying ethical issues and working through the process of applying for ethics approval; providing a clear plan and timeline for each stage of the research. At the completion of this unit, students will have undertaken an ethics application, planned, orally presented and written up a research proposal. This unit of study is recommended for students who wish to undertake Honours after completion of the pass degree.

REHB3064
Alcohol and Drug Misuse Rehabilitation

Credit points: 6 **Teacher/Coordinator:** Dr Rodd Rothwell **Session:** Semester 1 **Classes:** Online **Prerequisites:** (HSBH1006, (HSBH1007 or HSBH2007), HSBH1008, HSBH1009) or 48 credit points of previous study. **Prohibitions:** REHB3061 **Assessment:** Short answer test (20%), Essay 2500 words (40%), 2 x online MCQ tests (40%) **Mode of delivery:** Distance education

Note: Students must have completed 48 credit points to enrol in this unit

This unit introduces students to issues relating to a major public health problem: the misuse of alcohol and other addictive drugs. The unit introduces students to two major aspects of this area: issues relating to the development of health prevention/health promotion policy, covering the philosophies of harm minimisation and zero tolerance; approaches to rehabilitation and treatment of those overusing both alcohol and other drugs. The unit commences with an analysis of public health policy approaches to the rehabilitation and treatment of people overusing alcohol and other harmful drugs. Students will be required to undertake an exercise involving an analysis of the effectiveness of the two major policy approaches to the problem of drug overuse and abuse: harm reduction and zero tolerance. They will be required to examine the evidence supporting these two approaches to public health policy. In the second part of the unit students will study the major therapeutic approaches to treatment and rehabilitation. This will include familiarisation with Alcoholics Anonymous, clinically based approaches including transactional analysis and other group therapy oriented approaches, the various behavioural therapies, therapeutic communities, methadone maintenance, needle exchange and recent trails in safe injection facilities. They will become familiar with the nature of services offered, the role of the various health professionals in these services and the nature of effective treatment and rehabilitation outcomes.

History and Philosophy of Science

Study in the discipline of History and Philosophy of Science is offered by the School of History and Philosophy and Science in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

A major in History and Philosophy of Science (HPS) will allow you to enrich and deepen your knowledge of science and its place in modern society. The study of HPS also allows you to stand back from the specialised concerns of other subjects by gaining a broader perspective on what science is, how it acquired its current form, how it fits into contemporary society, and to analyse the ramifications of scientific developments in a social, cultural, and ethical perspective.

Graduates emerge with an ability to identify and examine the conceptual and social dimensions of science and technology in an historical perspective using a variety of scholarly techniques. History and Philosophy of Science is a valuable field of study for any career requiring an understanding of science, with particular relevance for careers in government or industry that require addressing and managing complex problems.

Requirements for completion

A major in History and Philosophy of Science requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)24 credit points of 3000-level core units

A minor in History and Philosophy of Science is available and articulates to this major.

First year

Core: HPSC1X00 Bioethics and HPSC1X01 What is this thing called Science?

Second year

Core: HPSC2X00 The Birth of Modern Science and HPSC2011 Science Ethics and Society

Third year

Core: HPSC3002 History and Philosophy of the Biomedical Sciences, HPSC3016 The Scientific Revolution, HPSC3108 History and Philosophy of the Physical Sciences, HPSC3023 History and Philosophy of Psychology and Psychiatry.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of History and Philosophy of Science: completion of 24 credit points of project work and 24 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/science/hps/

E hps.admin@sydney.edu.au
T +61 2 9351 4226

Address:
Unit of History and Philosophy of Science
Level 3, Carslaw Building F07
University of Sydney NSW 2006

Learning Outcomes

Graduates emerge with an ability to identify and examine the conceptual and social dimensions of science and technology in an historical perspective using a variety of scholarly techniques. It is a valuable field of study for any career requiring an understanding of science, with particular relevance for careers in government or industry that require addressing and managing complex problems.

It is especially usefully for science students in that it allows reflective exploration of the practices and theories within various scientific fields. However, any student with a genuine interest in science will derive benefit from study in HPS.

History and Philosophy of Science

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
HISTORY AND PHILOSOPHY OF SCIENCE			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
History and Philosophy of Science major			
A major in History and Philosophy of Science requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 24 credit points of 3000-level core units			
History and Philosophy of Science minor			
A minor in History and Philosophy of Science requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
HPSC1000 **Bioethics**	6	**N** HPSC1900 *This Junior unit of study is highly recommended to Intermediate and Senior Life Sciences students.*	Intensive July Semester 1 Summer Main
HPSC1900 **Bioethics (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** HPSC1000 *Note: Department permission required for enrolment*	Semester 1
HPSC1001 **What is this Thing Called Science?**	6	**N** HPSC2101 or HPSC2901 or HPSC1901	Semester 2
HPSC1901 **What is this Thing Called Science? (Adv)**	6	**A** (ATAR 90 or above) or equivalent **N** HPSC2101 or HPSC2901 or HPSC1001 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
HPSC2100 **The Birth of Modern Science**	6	**P** 24 credit points of Junior units of study **N** HPSC2900	Semester 1 Summer Main
HPSC2900 **The Birth of Modern Science (Advanced)**	6	**P** 24 credit points of Junior study with a Distinction average **N** HPSC2100 *Note: Department permission required for enrolment*	Semester 1
HPSC2011 **Science, Ethics and Society**	6	**A** Students should be familiar will introductory material in Philosophy of Science, Ethics or Sociology. **N** HPSC3107	Semester 1
3000-level units of study			
Core			
HPSC3002 **Hist and Phil of the Biomedical Sciences**	6	**P** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901)	Semester 2
HPSC3016 **The Scientific Revolution**	6	**P** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901)	Semester 2
HPSC3108 **Hist and Phil of the Physical Sciences**	6	**P** HPSC2101 or HPSC2901	Semester 1
HPSC3023 **Psychology and Psychiatry: History and Phil**	6	**A** HPSC2100 and HPSC2101 **P** (12 credit points of Intermediate HPSC units) OR (Credit or greater in an HPSC Intermediate unit) OR (12 Intermediate credit points in Psychology units)	Semester 1
Minor selective			
HPSC3002 **Hist and Phil of the Biomedical Sciences**	6	**P** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901)	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
HPSC3016 **The Scientific Revolution**	6	**P** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901)	Semester 2
HPSC3108 **Hist and Phil of the Physical Sciences**	6	**P** HPSC2101 or HPSC2901	Semester 1
HPSC3023 **Psychology and Psychiatry: History and Phil**	6	**A** HPSC2100 and HPSC2101 **P** (12 credit points of Intermediate HPSC units) OR (Credit or greater in an HPSC Intermediate unit) OR (12 Intermediate credit points in Psychology units)	Semester 1

History and Philosophy of Science

HISTORY AND PHILOSOPHY OF SCIENCE

Advanced coursework and projects will be available in 2020 for students who complete this major.

History and Philosophy of Science major

A major in History and Philosophy of Science requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) 24 credit points of 3000-level core units

History and Philosophy of Science minor

A minor in History and Philosophy of Science requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

HPSC1000
Bioethics

Credit points: 6 **Teacher/Coordinator:** Assoc. Professor Dominic Murphy **Session:** Intensive July, Semester 1, Summer Main **Classes:** Three 1 hour lectures and one 1 hour tutorial per week **Prohibitions:** HPSC1900 **Assessment:** 3 x 1,250 word papers and tutorial work **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This Junior unit of study is highly recommended to Intermediate and Senior Life Sciences students.

Science has given us nearly infinite possibilities for controlling life. Scientists probe the origins of life through research with stem cells and embryos. To unlock the secrets of disease, biomedicine conducts cruel experiments on animals. GM crops are presented as the answer to hunger. Organ transplantation is almost routine. The international traffic in human body parts and tissues is thriving. The concept of brain death makes harvesting organs ethically more acceptable. It may also result in fundamental changes in our ideas about life. Science has provided new ways of controlling and manipulating life and death. As a consequence, difficult ethical questions are raised in increasingly complex cultural and social environments. This course will discuss major issues in the ethics of biology and medicine, from gene modification to Dolly the sheep. This unit will be introductory, but a small number of topical issues will be studied in depth. No scientific background beyond Year 10 level will be assumed.

Textbooks
Course Reader

HPSC1900
Bioethics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Assoc. Professor Dominic Murphy **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial per week. **Prohibitions:** HPSC1000 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** 3 x 1,250 word papers and tutorial work **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The topics covered by HPSC1000 - Bioethics will be treated in more depth, in a special tutorial set aside for Advanced students.

Textbooks
Course Reader

HPSC1001
What is this Thing Called Science?

Credit points: 6 **Teacher/Coordinator:** Prof Peter Godfrey-Smith **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr online study; and 1x1-hr tutorial per week **Prohibitions:** HPSC2101 or HPSC2901 or HPSC1901 **Assessment:** essays and online tasks **Mode of delivery:** Normal (lecture/lab/tutorial) day

What distinguishes creationism from evolutionary theory, or astrology from astronomy? Can we have good reason to believe that our current scientific theories represent the world "as it really is"? This course critically examines the most important attempts to describe the scientific method, to draw a line dividing science from non-science, and to justify the high status generally accorded to scientific knowledge. Views studied include Karl Popper's idea that scientific theories are falsifiable in principle, Thomas Kuhn's proposal that science consists of a series of paradigms separated by abrupt scientific revolutions, and claims by Feyerabend and others that there are no objective criteria by which science can be distinguished from pseudo-science. This unit of study also explores contemporary theories of evidence and explanation, the role of social values in science, sociological approaches to understanding science, and the nature of scientific change.

Textbooks
Godfrey-Smith, P (2003). Theory and Reality. The University of Chicago Press. USA/ Curd, Cover and Pincock (2013). Philosophy of Science: The Central Issues (2nd edition). W. W. Norton and Company.

HPSC1901
What is this Thing Called Science? (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Godfrey-Smith **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr online study; and 1x1-hr advanced tutorial per week **Prohibitions:** HPSC2101 or HPSC2901 or HPSC1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** essays, online tasks and presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What distinguishes creationism from evolutionary theory, or astrology from astronomy? Can we have good reason to believe that our current scientific theories represent the world "as it really is"? This course critically examines the most important attempts to describe the scientific method, to draw a line dividing science from non-science, and to justify the high status generally accorded to scientific knowledge. Views studied include Karl Popper's idea that scientific theories are falsifiable in principle, Thomas Kuhn's proposal that science consists of a series of paradigms separated by abrupt scientific revolutions, and claims by Feyerabend and others that there are no objective criteria by which science can be distinguished from pseudo-science. This unit of study also explores contemporary theories of evidence and explanation, the role of social values in science, sociological approaches to understanding science, and the nature of scientific change.

Textbooks

Godfrey-Smith, P (2003). Theory and Reality. The University of Chicago Press. USA/ Curd, Cover and Pincock (2013). Philosophy of Science: The Central Issues (2nd edition). W. W. Norton and Company.

2000-level units of study

Core

HPSC2100
The Birth of Modern Science

Credit points: 6 **Teacher/Coordinator:** Professor Ofer Gal **Session:** Semester 1, Summer Main **Classes:** Three 1 hour lectures, one 1 hour tutorial per week. **Prerequisites:** 24 credit points of Junior units of study **Prohibitions:** HPSC2900 **Assessment:** 4xquizzes (30%) and 6x100wd questions (30%) and 3x750wd essays (30%) and class participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Modern culture is a culture of science and modern science is the outcome of a historical process of 2,500 years. In this course we investigate how traditional knowledge gradually acquired the characteristics of 'science': the social structure, contents, values and methods we are familiar with. We will look at some primary chapters of this process, from antiquity to the end of the seventeenth century, and try to understand their implications to understanding contemporary science in its culture. Special emphasis will be given to the scientific revolution of the seventeenth century, which is often described as the most important period in the history of science and as one of the most vital stages in human intellectual history.

Textbooks

Dear, Peter: Revolutionizing the Sciences: European Knowledge and Ambitions, 1500-1700. 2nd ed. New York: Palgrave Macmillan (2009).

HPSC2900
The Birth of Modern Science (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof. Ofer Gal **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 24 credit points of Junior study with a Distinction average **Prohibitions:** HPSC2100 **Assessment:** 2x1500wd essays (45%) and 1x3000 wd essay (45%) and class presentation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The topics covered in 'The Birth of Modern Science' will be covered in more depth, in a special tutorial set aside for advanced students.

Textbooks

Henry, J (2002). The Scientific Revolution and the Origins of Modern Science. Palgrave Macmillan. Course reader

HPSC2011
Science, Ethics and Society

Credit points: 6 **Teacher/Coordinator:** Dr Daniela Helbig **Session:** Semester 1 **Classes:** lecture 2hrs/ week; tutorial 1 hr/week **Prohibitions:** HPSC3107 **Assumed knowledge:** Students should be familiar will introductory material in Philosophy of Science, Ethics or Sociology. **Assessment:** assignments, quizzes, tutorial participation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study investigates the place of science in society, the internal dynamics of science, and ethical issues within science and in relation to its application. The key idea in this course is that science is a social activity that can be studied like other social phenomena and behaviour. There are three components to this Unit of Study: an exploration of the motivations of scientists and how they can be described using cognitive and ethical rules; science and the media; and ethical issues that have become prominent because of recent developments in science.

Textbooks

Course reader

3000-level units of study

Core

HPSC3002
Hist and Phil of the Biomedical Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Daniela Helbig **Session:** Semester 2 **Classes:** Two 1 hour lectures and two 1 hour tutorials per week. **Prerequisites:** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **Assessment:** 2x300-400wd reports (25%) and 1xclass presentation (25%) and class questions (10%) and 1x2500-3000 wd essay (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Throughout the ages people have been born, have died, and in between have lived in various stages of sickness or health. In this unit of study we shall look at how these states of being were perceived in different times and places throughout history, while at the same time noting the increasing medicalisation of everyday life, together with the irony that the "miracles" of modern medicine appear to have created a generation of the "worried well". Using this historical perspective, we shall ask how perceptions of sickness, health and the related provision of health care have been intertwined with social, political and economic factors and, indeed still are today.

Textbooks

Course reader

HPSC3016
The Scientific Revolution

Credit points: 6 **Teacher/Coordinator:** Prof Ofer Gal **Session:** Semester 2 **Classes:** Two 1 hour lectures and two 1 hour tutorials per week. Individual student consultation as required. **Prerequisites:** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **Assessment:** 10x150wd questions (40%) and 1x 3500wd essay (40%) and 1 x Experiment (10%) and Class Participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Modern Western science has a number of characteristics that distinguish it from other scientific cultures. It ascribes its tremendous success to sophisticated experiments and meticulous observation. It understands the universe in terms of tiny particles in motion and the forces between them. It is characterised by high- powered mathematical theorising and the rejection of any intention, value or purpose in Nature. Many of these characteristics were shaped in the 17th century, during the so-called scientific revolution. We will consider them from an integrated historical- philosophical perspective, paying special attention to the intellectual motivations of the canonical figures of this revolution and the cultural context in which they operated. Topics will include: experimentation and instrumentation, clocks, mechanistic philosophy, and the changing role of mathematics.

Textbooks

Course reader

HPSC3108
Hist and Phil of the Physical Sciences

Credit points: 6 **Teacher/Coordinator:** Professor Dean Rickles **Session:** Semester 1 **Classes:** One 2-hour lecture and two 1-hour tutorials per week. **Prerequisites:** HPSC2101 or HPSC2901 **Assessment:** Four 1500-word essays (4x25%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study deals with a selection of contemporary debates in the history and philosophy of natural sciences. It covers four main themes: (1) the question of how evidence is gathered in the natural sciences and how it is (and/or other factors) go into confirming theories-we also consider what confirmation consists in (including an examination of Bayesianism). (2) Issues of modelling, representation, and measurement, including an analysis of the ways idealisation, approximation, and simulation are to be understood. (3) Models of scientific explanation, including recent work on laws, prediction, and causality. (4) issues of emergence and reduction, including the problems associated with defining such concepts - we also consider notions of simplicity and the impact of the sciences of complexity. The unit of study involves case studies from the natural sciences that allow students to apply their knowledge and test their understanding. Upon completion of the unit, students will have developed a range of skills that will allow them to explore the physical sciences with more critical attitude.

Textbooks
Course reader

HPSC3023
Psychology and Psychiatry: History and Phil

Credit points: 6 **Teacher/Coordinator:** A/Prof Hans Pols and Dr Fiona Hibberd **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** (12 credit points of Intermediate HPSC units) OR (Credit or greater in an HPSC Intermediate unit) OR (12 Intermediate credit points in Psychology units) **Assumed knowledge:** HPSC2100 and HPSC2101 **Assessment:** 1x 2500wd essay (45%) and 1x2hr exam (45%) class participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Across the unit we examine one of the most interesting aspects of the history and philosophy of science. viz., the scientific practices and assumptions involved in making human beings an object of study. We will examine the ways in which psychologists and psychiatrists have investigated human nature, the kinds of experimental approaches they have developed to that end, the major controversies in this field, and the basic philosophical assumptions that have been made in the sciences of human nature. We investigate the developments of psychological theories and investigative methods as well as the development of psychiatric theory, treatment methods, and institutions.

Minor selective

HPSC3002
Hist and Phil of the Biomedical Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Daniela Helbig **Session:** Semester 2 **Classes:** Two 1 hour lectures and two 1 hour tutorials per week. **Prerequisites:** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **Assessment:** 2x300-400wd reports (25%) and 1xclass presentation (25%) and class questions (10%) and 1x2500-3000 wd essay (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Throughout the ages people have been born, have died, and in between have lived in various stages of sickness or health. In this unit of study we shall look at how these states of being were perceived in different times and places throughout history, while at the same time noting the increasing medicalisation of everyday life, together with the irony that the "miracles" of modern medicine appear to have created a generation of the "worried well". Using this historical perspective, we shall ask how perceptions of sickness, health and the related provision of health care have been intertwined with social, political and economic factors and, indeed still are today.

Textbooks
Course reader

HPSC3016
The Scientific Revolution

Credit points: 6 **Teacher/Coordinator:** Prof Ofer Gal **Session:** Semester 2 **Classes:** Two 1 hour lectures and two 1 hour tutorials per week. Individual student consultation as required. **Prerequisites:** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **Assessment:** 10x150wd questions (40%) and 1x 3500wd essay (40%) and 1 x Experiment (10%) and Class Participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Modern Western science has a number of characteristics that distinguish it from other scientific cultures. It ascribes its tremendous success to sophisticated experiments and meticulous observation. It understands the universe in terms of tiny particles in motion and the forces between them. It is characterised by high- powered mathematical theorising and the rejection of any intention, value or purpose in Nature. Many of these characteristics were shaped in the 17th century, during the so-called scientific revolution. We will consider them from an integrated historical- philosophical perspective, paying special attention to the intellectual motivations of the canonical figures of this revolution and the cultural context in which they operated. Topics will include: experimentation and instrumentation, clocks, mechanistic philosophy, and the changing role of mathematics.

Textbooks
Course reader

HPSC3108
Hist and Phil of the Physical Sciences

Credit points: 6 **Teacher/Coordinator:** Professor Dean Rickles **Session:** Semester 1 **Classes:** One 2-hour lecture and two 1-hour tutorials per week. **Prerequisites:** HPSC2101 or HPSC2901 **Assessment:** Four 1500-word essays (4x25%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study deals with a selection of contemporary debates in the history and philosophy of natural sciences. It covers four main themes: (1) the question of how evidence is gathered in the natural sciences and how it is (and/or other factors) go into confirming theories-we also consider what confirmation consists in (including an examination of Bayesianism). (2) Issues of modelling, representation, and measurement, including an analysis of the ways idealisation, approximation, and simulation are to be understood. (3) Models of scientific explanation, including recent work on laws, prediction, and causality. (4) issues of emergence and reduction, including the problems associated with defining such concepts - we also consider notions of simplicity and the impact of the sciences of complexity. The unit of study involves case studies from the natural sciences that allow students to apply their knowledge and test their understanding. Upon completion of the unit, students will have developed a range of skills that will allow them to explore the physical sciences with more critical attitude.

Textbooks
Course reader

HPSC3023
Psychology and Psychiatry: History and Phil

Credit points: 6 **Teacher/Coordinator:** A/Prof Hans Pols and Dr Fiona Hibberd **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** (12 credit points of Intermediate HPSC units) OR (Credit or greater in an HPSC Intermediate unit) OR (12 Intermediate credit points in Psychology units) **Assumed knowledge:** HPSC2100 and HPSC2101 **Assessment:** 1x 2500wd essay (45%) and 1x2hr exam (45%) class participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Across the unit we examine one of the most interesting aspects of the history and philosophy of science. viz., the scientific practices and assumptions involved in making human beings an object of study. We will examine the ways in which psychologists and psychiatrists have investigated human nature, the kinds of experimental approaches they have developed to that end, the major controversies in this field, and the basic philosophical assumptions that have been made in the sciences of human nature. We investigate the developments of psychological theories and investigative methods as well as the development of psychiatric theory, treatment methods, and institutions.

Human Movement

Study in the Discipline of Human Movement is offered by the Faculty of Health Sciences. The Human Movement major and minor are available to students in the Health stream as a second major or minor only.

About the major

A major in Human Movement integrates anatomical, physiological and biomechanical principles related to human movement and will equip you with a background to assist in health service roles and the conduct of research and analysis of data relevant to the study of human movement.

The Human Movement major provides a strong foundation for further graduate study in fields such as physiotherapy and medicine (subject to meeting eligibility criteria).

Requirements for completion

A major in Human Movement requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)18 credit points of 2000-level core units
(iii)12 credit points of 3000-level core units
(iv)6 credit points of 3000-level selective units

A minor in Human Movement is available and articulates to this major.

First year

BIOS1168 and BIOS1169 introduce functional musculoskeletal anatomy specifically designed for the study of human movement.

Second year

BIOS2170, BIOS2171, EXSS2XXX cover in depth study of various systems relevant to human movement including cardiovascular, respiratory, renal and nervous systems as well as how muscles adapt to use and disuse.

Third year

EXSS3XX2, EXSS3XX1 and 6 credit points from a selection of: EXSS3XX3, BIOS3065.

This suite of 3000 level units is designed to help you understand how one learns and controls movements, how to analyse movement, and how the body responds to exercise.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000 level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020

Honours
Requirements for Honours in the area of Human Movement: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/health-sciences/contact/index.shtml

T 1800 793 864

Address:
Faculty of Health Sciences
75 East St
Lidcombe NSW 2141

Dr Mark Halaki
T +61 2 9351 9883
E mark.halaki@sydney.edu.au

Learning Outcomes

Students who graduate from Human Movement will be able to:

1. Demonstrate the ability to integrate the anatomical, physiological and biomechanical principles related to human movement.
2. Demonstrate the ability to identify and apply scientific, evidence-based approaches to the measurement and enhancement of human movement.
3. Demonstrate the ability to interpret findings and to solve problems in a range of human movement performance contexts.
4. Develop knowledge, skills and attitudes about human movement that are transferable across global contexts, employment sectors and people.
5. Communicate effectively using a variety of modalities and technologies.
6. Develop the necessary skills, attitudes and behaviours to provide responsible, ethical, socially acceptable practices.

Human Movement

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
HUMAN MOVEMENT			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Human Movement major This major is only available to students enrolled in the Health stream, as a second major.			
A major in Human Movement requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units			
Human Movement minor This minor is only available to students enrolled in the Health stream.			
A minor in Human Movement requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 6 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOS1168 **Functional Musculoskeletal Anatomy A**	6	**N** BIOS1136 or BIOS1159 or BIOS5090 *Semester 1 Unit Coordinators are Dr Cliffton Chan and A/Prof Leslie Nicholson, Semester 2 unit coordinator is Dr Joanna Diong*	Semester 1 Semester 2
BIOS1169 **Functional Musculoskeletal Anatomy B**	6	**P** BIOS1168 **N** BIOS1139 or BIOS1144 or BIOS1160	Semester 1 Semester 2
2000-level units of study			
Core			
BIOS2170, BIOS2171 and EXSS2XXX to be developed for offering in 2019.			
3000-level units of study			
Major core			
EXSS3XX2 and EXSS3XX1 to be developed for offering in 2019.			
Major selective			
BIOS3065 **Anatomical Analysis of Exercise**	6	**P** BIOS1168 and BIOS1169	Semester 2
EXSS3XX3 to be developed for offering in 2019.			
Minor selective			
BIOS3065 **Anatomical Analysis of Exercise**	6	**P** BIOS1168 and BIOS1169	Semester 2
EXSS3XX1 and EXSS3XX3 to be developed for offering in 2019.			

Human Movement

HUMAN MOVEMENT

Advanced coursework and projects will be available in 2020 for students who complete this major.

Human Movement major

This major is only available to students enrolled in the Health stream, as a second major.A major in Human Movement requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 18 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units(iv) 6 credit points of 3000-level selective units

Human Movement minor

This minor is only available to students enrolled in the Health stream.A minor in Human Movement requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 6 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOS1168
Functional Musculoskeletal Anatomy A

Credit points: 6 **Teacher/Coordinator:** Dr Cliffton Chan, Dr Joanna Diong **Session:** Semester 1, Semester 2 **Classes:** 2hr lectures, 2hr practical:tutorial/week **Prohibitions:** BIOS1136 or BIOS1159 or BIOS5090 **Assessment:** Mid semester practical exam (30%), end semester practical exam (30%), end semester exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Semester 1 Unit Coordinators are Dr Cliffton Chan and A/Prof Leslie Nicholson, Semester 2 unit coordinator is Dr Joanna Diong

This unit of study introduces the basic concepts in musculoskeletal anatomy prior to a more detailed study of the gross anatomical structure of the upper limb as it relates to functional activities. Students will also study the histological structure of musculoskeletal tissues and surface anatomy of the upper limb. Material will be presented in lectures, practical sessions and online. Students will also be expected to undertake some independent learning activities. This unit includes laboratory classes in which human cadavers are studied; attendance at such classes is compulsory.

BIOS1169
Functional Musculoskeletal Anatomy B

Credit points: 6 **Teacher/Coordinator:** Ms Jan Douglas-Morris **Session:** Semester 1, Semester 2 **Classes:** 2hr lectures, 2hr practical-tutorial/week **Prerequisites:** BIOS1168 **Prohibitions:** BIOS1139 or BIOS1144 or BIOS1160 **Assessment:** Online test (5%), mid-semester practical exam (30%), end-semester practical exam (25%), end-semester theory exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines the detailed gross, radiological and surface anatomy of the lower limb, trunk and neck. Included are the anatomical analyses of functional activities which involve the lower limb, back and neck. Material will be presented in lectures, practical and tutorial sessions and online. Students will also be expected to undertake some independent learning activities. This unit includes laboratory classes in which human cadavers are studied; attendance at such classes is compulsory.

2000-level units of study

Core

BIOS2170, BIOS2171 and EXSS2XXX to be developed for offering in 2019.

3000-level units of study

Major core

EXSS3XX2 and EXSS3XX1 to be developed for offering in 2019.

Major selective

BIOS3065
Anatomical Analysis of Exercise

Credit points: 6 **Teacher/Coordinator:** Assoc Prof Karen Ginn **Session:** Semester 2 **Classes:** 2hr lecture, 2hr practical, tutorial/week **Prerequisites:** BIOS1168 and BIOS1169 **Assessment:** Quizzes (3x10%), mid-semester exam (35%), end semester exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will extend the student's knowledge of functional musculoskeletal anatomy by applying functional anatomy principles to the analysis of exercises. Relevant research and advanced knowledge of functional musculoskeletal anatomical concepts will be used to explore exercises designed to: strengthen and lengthen specific muscles; improve muscle coordination; develop dynamic stability; and prevent the development of muscle imbalances that may contribute to musculoskeletal injury. The application of musculoskeletal anatomy principles to increase exercise difficulty and variety will also be explored. This unit will include laboratory classes in which human cadavers are studied; attendance at such classes is strongly encouraged.

EXSS3XX3 to be developed for offering in 2019.

Minor selective

BIOS3065
Anatomical Analysis of Exercise

Credit points: 6 **Teacher/Coordinator:** Assoc Prof Karen Ginn **Session:** Semester 2 **Classes:** 2hr lecture, 2hr practical, tutorial/week **Prerequisites:** BIOS1168 and BIOS1169 **Assessment:** Quizzes (3x10%), mid-semester exam (35%), end semester exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will extend the student's knowledge of functional musculoskeletal anatomy by applying functional anatomy principles to the analysis of exercises. Relevant research and advanced knowledge of functional musculoskeletal anatomical concepts will be used to explore exercises designed to: strengthen and lengthen specific muscles; improve muscle coordination; develop dynamic stability; and prevent the development of muscle imbalances that may contribute to musculoskeletal injury. The application of musculoskeletal anatomy principles to increase exercise difficulty and variety will also be explored. This unit will include laboratory classes in which human cadavers are studied; attendance at such classes is strongly encouraged.

EXSS3XX1 and EXSS3XX3 to be developed for offering in 2019.

Immunology

Study in Immunology is offered by the Discipline of Infectious Diseases and Immunology in the Sydney Medical School. Units of study in this minor are available at standard and advanced level.

About the minor

The immune system is an integrated network of cells and specialised organs that can respond to external and internal threats. It can be mobilized to protect humans from infections and cancer while simultaneously being the underlying mechanism of major acute and chronic pathologies.

The Immunology minor examines how it is that our immune system can be both the cause and the cure of disease in humans and animals. This is important, as an understanding of immunological and pathological mechanisms allows us to think about how our immune system can be manipulated to prevent and treat disease. This minor draws together studies in immunology, pathology, microbiology, biology, biochemistry, and physiology.

Studies in immunology are important because they are leading to advances in clinical medicine and clinical science, including helping develop new vaccines and immuno-therapies. In addition, immunological techniques are widely used in biology, endocrinology, microbiology, cell and molecular biology, neurobiology and genetics.

Requirements for completion

A minor in Immunology requires 36 credit points, consisting of:
(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level selective units
(iii)6 credit points of 2000-level core units
(iv)6 credit points of 2000-level selective units
(v)12 credit points of 3000-level core units

First year

CHEM1XX1 and 6 credit points from a selection of BIOL1XX7 and BIOL1XX8 (MEDS1X01 is only available to students enrolled in the medical science stream).

Second year

IMMU2101 (MIMI2X02 in 2019) and 6 credit points from a selection of BCMB2X01 and IMMU2X11 (BMED2404, MEDS2004 and MEDS2003 only available to students enrolled in the medical science stream).

For Medical Science stream students: BMED2404 (MEDS2004 in 2019) and 6 credit points from a selection of MEDS2003 and IMMU2X11. Please note, BMED and MEDS units are only offered to Medical Science stream students.

Third year

Core: IMMU3102/3902 (IMMU3X11 in 2019), IMMU3202/3903 (IMMU3X12 in 2019).

In your third year you must take at least one designated project unit.

Contact and further information

W sydney.edu.au/medicine/infectious-diseases-immunology/contact/

Address:
Infectious Diseases and Immunology
Level 5 (East), Charles Perkins Centre hub (D17)
University of Sydney NSW 2006

Associate Professor Scott Byrne
E scott.byrne@sydney.edu.au
T +61 2 9351 7308

Professor Nicholas King
E nicholas.king@sydney.edu.au
T +61 2 9351 4553

Learning Outcomes

Students who graduate from Immunology will be able to:

1. Grasp the fundamentals of immunology and pathology and be able to apply these to a range of disease contexts
2. Understand how the cells and molecules of our immune system cooperate to keep us healthy and fight disease;
3. Understand the common generic pathophysiological responses to pathological stress in disease
4. Understand that our immune system can be both the cause and the cure of pathology in humans and animals;
5. Understand the cellular and molecular basis of the pathogenesis of a diverse range of human diseases;
6. Think about how our immune system can be manipulated to prevent and treat disease
7. Understand that immunology can be applied to the development of novel diagnostic pathology assays
8. Show competency in a range of valuable immunological and pathological techniques/skills
9. Apply immunological and pathological approaches to address a diverse range of pathological problems
10. Appreciate that various therapeutic approaches that target cells and molecules of our immune and other organ systems are leading to breakthroughs in human disease detection, treatment and management.

Immunology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Immunology minor			
A minor in Immunology requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 12 credit points of 3000-level core units			
Units of study			
The relevant units of study are listed below.			
1000-level units of study			
Core			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
Selective			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
2000-level units of study			
Core			
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
MEDS2004 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
Selective			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
IMMU2X11 and MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Core			
IMMU3102 **Molecular and Cellular Immunology**	6	**P** IMMU2101 or (BMED2401 and BMED2404) **N** IMMU3902 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3902 **Molecular and Cellular Immunology (Advanced)**	6	**P** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **N** IMMU3102 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3202 **Immunology in Human Disease**	6	**P** IMMU2101 or (BMED2401 and BMED2404) **N** IMMU3903 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3903 **Immunology in Human Disease (Advanced)**	6	**P** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **N** IMMU3202 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3X11 and IMMU3X12 to be developed for offering in 2019.			

Immunology

Immunology minor

A minor in Immunology requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 12 credit points of 3000-level core units

Units of study

The relevant units of study are listed below.

1000-level units of study

Core

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Selective

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks
TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Core

BMED2404
Microbes, Infection and Immunity

Credit points: 6 **Teacher/Coordinator:** Dr Jim Manos **Session:** Semester 2 **Classes:** Two lectures and one practical per week, two tutorials **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), in-semester assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study begins by introducing the concepts of disease transmission, pathogenicity and virulence mechanisms of microbes. For a full understanding of the process of infection, the structure and function of pathogenic microorganisms is examined. How the body deals with injury and infection is discussed by exploring barriers to infection and host response once those barriers are breached. The body's response to such physical damage is dealt with in a series of lectures on wound healing, clotting and inflammation, and is complemented by discussion of the pharmacological basis of anti-inflammatory drugs. This is followed by a comprehensive discussion of molecular and cellular immune responses to pathogen invasion. In particular, this gives students an appreciation of the processing of antigens, the structure, production and diversity of antibodies, the operation of the complement system and mechanisms for recognition and destruction of invading microbes. The unit concludes with an overview of microbial diseases, the characteristics of causative agents, pathogenesis and symptoms as well as treatment and control and culminates with exploring current issues of antibiotic resistance, important emerging infections and vaccination strategies.

Practical classes illustrate and underpin the lecture content. Students will investigate normal flora, host defences and medically important microbes and will obtain experience in, and an understanding of, a range of techniques in bacteriology. In these practical sessions experience will be gained handling live, potentially pathogenic microbes.

Textbooks
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
Basic Immunology: Functions and Disorders of the Immune System. Abass AK and Lichtman AH WB Saunders, 4th Edition, 2013
Robbins Basic Pathology Kumar V, Abbas AK and Aster J Saunders, Philadelphia, 9th Edition, 2013

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1 **Assessment:** Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks
Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

MEDS2004 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

Selective

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for

cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901
Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

IMMU2X11 and MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Core

IMMU3102
Molecular and Cellular Immunology

Credit points: 6 **Teacher/Coordinator:** A/Prof Carl Feng **Session:** Semester 2 **Classes:** Three 1 hour lectures, one tutorial and one 4-hour practical per fortnight. **Prerequisites:** IMMU2101 or (BMED2401 and BMED2404) **Prohibitions:** IMMU3902 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This study unit builds on the series of lectures that outlined the general properties of the immune system, effector lymphocytes and their functions, delivered in the core courses, IMMU2101 - Introductory Immunology and BMED2404 - Microbes, Infection and Immunity (formerly IMMU2001 and BMED2807). In this unit the molecular and cellular aspects of the immune system are investigated in detail. We emphasise fundamental concepts to provide a scientific basis for studies of the coordinated and regulated immune responses that lead to elimination of infectious organisms. Guest lectures from research scientists eminent in particular branches of immunological research are a special feature of the course. These provide challenging information from the forefront of research that will enable the student to become aware of the many components that come under the broad heading 'Immunology'. Three lectures (1 hour each) will be given each fortnight: 2 lectures in one week and one lecture the following week, for the duration of the course. This unit directly complements the unit 'Immunology in Human Disease IMMU3202' and students are very strongly advised to undertake these study units concurrently.

Textbooks

Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier.

IMMU3902
Molecular and Cellular Immunology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Carl Feng **Session:** Semester 2 **Classes:** 3 lectures, 1 special seminar/tutorial (2 hours), 1 practical (4 hours) every 2 weeks. **Prerequisites:** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **Prohibitions:** IMMU3102 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Introductory Immunology (IMMU2101). Advanced students will complete the same core lecture material as students in IMMU3102 but carry out advanced level practical work and a series of specialized seminar based tutorial classes.

Textbooks

Textbooks Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier.

IMMU3202
Immunology in Human Disease

Credit points: 6 **Teacher/Coordinator:** A/Prof Allison Abendroth **Session:** Semester 2 **Classes:** Three 1 hour lectures, one tutorial and one 4 hour practical per fortnight. **Prerequisites:** IMMU2101 or (BMED2401 and BMED2404) **Prohibitions:** IMMU3903 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This study unit builds on the series of lectures that outlined the general properties of the immune system, effector lymphocytes and their functions, delivered in the core courses, IMMU2101 - Introductory Immunology and BMED2404 - Microbes, Infection and Immunity (formerly IMMU2001 and BMED2807). We emphasise fundamental concepts to provide a scientific basis for studies in clinical immunology; dysfunctions of the immune system e.g. autoimmune disease, immunodeficiencies, and allergy, and immunity in terms of host - pathogen interactions. This unit has a strong focus on significant clinical problems in immunology and the scientific background to these problems. The unit includes lectures from research scientists and clinicians covering areas such as allergy, immunodeficiency, autoimmune disease and transplantation. This course provides challenging information from the forefront of clinical immunology and helps the student develop an understanding of immune responses in human health and disease. Three lectures (1 hour each) will be given each fortnight: 2 lectures in one week and one lecture the following week, for the duration of the course. This unit directly complements the unit 'Molecular and Cellular Immunology IMMU3102' and students are very strongly advised to undertake these study units concurrently.

Textbooks

Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier

IMMU3903
Immunology in Human Disease (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Allison Abendroth **Session:** Semester 2 **Classes:** 3 lectures,1 seminar/tutorial (2 hours) and1 practical (4 hours) every 2 weeks. **Prerequisites:** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **Prohibitions:** IMMU3202 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Introductory Immunology (IMMU2101). Advanced students will complete the same core lecture material as students in IMMU3202 but carry out advanced level practical work and a series of specialized seminar based tutorial classes.

Textbooks

Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier

IMMU3X11 and IMMU3X12 to be developed for offering in 2019.

Immunology and Pathology

Study in Immunology and Pathology is offered by the Discipline of Infectious Diseases and Immunology and the Discipline of Pathology in the Sydney Medical School. Units of study in this major are available at standard and advanced level.

About the major

The immune system is an integrated network of cells and specialised organs that can respond to external and internal threats. It can be mobilized to protect humans from infections and cancer while simultaneously being the underlying mechanism of major acute and chronic pathologies.

The Immunology and Pathology major examines how it is that our immune system can be both the cause and the cure of disease in humans and animals. This is important, as an understanding of immunological and pathological mechanisms allows us to think about how our immune system can be manipulated to prevent and treat disease. This major draws together studies in immunology, pathology, microbiology, biology, biochemistry, and physiology.

Studies in immunology and pathology are important because they are leading to advances in clinical medicine and clinical science, including helping develop new vaccines and immuno-therapies. In addition, immunological techniques are widely used in biology, endocrinology, microbiology, cell and molecular biology, neurobiology and genetics.

Requirements for completion

A major in Immunology and Pathology requires 48 credit points, consisting of:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level selective units
(iii)6 credit points of 2000-level core units
(iv)6 credit points of 2000-level selective units
(v)24 credit points of 3000-level core units

A minor in Immunology and a minor in Pathology are available and articulate to this major.

First year

CHEM1XX1 and 6 credit points from a selection of BIOL1XX7 and BIOL1XX8 (MEDS1X01 is only available to students enrolled in the medical science stream).

Second year

IMMU2101 (MIMI2X02 in 2019) and 6 credit points from a selection of BCMB2X01 and IMMU2X11.

For Medical Science stream students: BMED2404 (MEDS2004 in 2019) and 6 credit points from a selection of MEDS2003 and IMMU2X11. (BMED and MEDS units are only offered to Medical Science stream students.)

Third year

Core: IMMU3102/3902 (IMMU3X11 in 2019), IMMU3202/3903 (IMMU3X12 in 2019), CPAT3201 (PATH3X11 in 2019), CPAT3202 (PATH3X12 in 2019).

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours

Requirements for Honours in the areas of Immunology and Pathology: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/medicine/infectious-diseases-immunology/contact/

Address:
Infectious Diseases and Immunology
Level 5 (East), Charles Perkins Centre hub (D17)
University of Sydney NSW 2006

Associate Professor Scott Byrne
E scott.byrne@sydney.edu.au
T +61 2 9351 7308

Professor Nicholas King
E nicholas.king@sydney.edu.au
T +61 2 9351 4553

Learning Outcomes

Students who graduate from Immunology and Pathology will be able to:

1. Have grasped the fundamentals of immunology and pathology and be able to apply these to a range of disease contexts
2. Understand how the cells and molecules of our immune system cooperate to keep us healthy and fight disease
3. Understand the common generic pathophysiological responses to pathological stress in disease
4. Understand that our immune system can be both the cause and the cure of pathology in humans and animals
5. Understand the cellular and molecular basis of the pathogenesis of a diverse range of human diseases
6. Think about how our immune system can be manipulated to prevent and treat disease
7. Understand that immunology can be applied to the development of novel diagnostic pathology assays
8. Be competent in a range of valuable immunological and pathological techniques/skills
9. Apply immunological and pathological approaches to address a diverse range of pathological problems
10. Appreciate that various therapeutic approaches that target cells and molecules of our immune and other organ systems are leading to breakthroughs in human disease detection, treatment and management.

Immunology and Pathology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
IMMUNOLOGY AND PATHOLOGY			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Immunology and Pathology major			
A major in Immunology and Pathology requires 48 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 24 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
Selective			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			
2000-level units of study			
Core			
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
MEDS2004 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
Selective			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
IMMU2X11 and MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Core			
IMMU3102 **Molecular and Cellular Immunology**	6	**P** IMMU2101 or (BMED2401 and BMED2404) **N** IMMU3902 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3902 **Molecular and Cellular Immunology (Advanced)**	6	**P** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **N** IMMU3102 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3202 **Immunology in Human Disease**	6	**P** IMMU2101 or (BMED2401 and BMED2404) **N** IMMU3903 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3903 **Immunology in Human Disease (Advanced)**	6	**P** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **N** IMMU3202 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
CPAT3201 **Pathogenesis of Human Disease 1**	6	**A** Sound knowledge of biology through meeting pre-requisites **P** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
CPAT3202 **Pathogenesis of Human Disease 2**	6	**A** Sound knowledge of biology through meeting pre-requisites **P** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) **C** CPAT3201 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3X11, IMMU3X12, PATH3X11 and PATH3X12 to be developed for offering in 2019.			

Immunology minor

A minor in Immunology requires 36 credit points from this table including:

(i) 6 credit points of 1000-level core units

(ii) 6 credit points of 1000-level selective units

(iii) 6 credit points of 2000-level core units

(iv) 6 credit points of 2000-level selective units

(v) 12 credit points of 3000-level core units

Units of Study

The relevant units of study are listed below.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
1000-level units of study			
Core			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
Selective			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			
2000-level units of study			
Core			
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
MEDS2004 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
Selective			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
IMMU2X11 and MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
3000-level units of study			
Core			
IMMU3102 **Molecular and Cellular Immunology**	6	**P** IMMU2101 or (BMED2401 and BMED2404) **N** IMMU3902 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3902 **Molecular and Cellular Immunology (Advanced)**	6	**P** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **N** IMMU3102 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3202 **Immunology in Human Disease**	6	**P** IMMU2101 or (BMED2401 and BMED2404) **N** IMMU3903 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3903 **Immunology in Human Disease (Advanced)**	6	**P** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **N** IMMU3202 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3X11 and IMMU3X12 to be developed for offering in 2019.			

Pathology Minor

A minor in Pathology requires 36 credit points from this table including:

(i) 6 credit points of 1000-level core units

(ii) 6 credit points of 1000-level selective units

(iii) 6 credit points of 2000-level core units

(iv) 6 credit points of 2000-level selective units

(v) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
1000-level units of study			
Core			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
Selective			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
(MEDS coded units of study are only available to students in the Medical Science stream).			
2000-level units of study			
Core			
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
MEDS2004 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
Selective for Pathology minor			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
IMMU2X11 and MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Core			
CPAT3201 **Pathogenesis of Human Disease 1**	6	**A** Sound knowledge of biology through meeting pre-requisites **P** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
CPAT3202 **Pathogenesis of Human Disease 2**	6	**A** Sound knowledge of biology through meeting pre-requisites **P** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) **C** CPAT3201 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PATH3X11 and PATH3X12 to be developed for offering in 2019.			

Immunology and Pathology

Immunology minor

A minor in Immunology requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 12 credit points of 3000-level core units

Units of study

The relevant units of study are listed below.

1000-level units of study

Core

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Selective

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks
TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Core

BMED2404
Microbes, Infection and Immunity

Credit points: 6 **Teacher/Coordinator:** Dr Jim Manos **Session:** Semester 2 **Classes:** Two lectures and one practical per week, two tutorials **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), in-semester assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study begins by introducing the concepts of disease transmission, pathogenicity and virulence mechanisms of microbes. For a full understanding of the process of infection, the structure and function of pathogenic microorganisms is examined. How the body deals with injury and infection is discussed by exploring barriers to infection and host response once those barriers are breached. The body's response to such physical damage is dealt with in a series of lectures on wound healing, clotting and inflammation, and is complemented by discussion of the pharmacological basis of anti-inflammatory drugs. This is followed by a comprehensive discussion of molecular and cellular immune responses to pathogen invasion. In particular, this gives students an appreciation of the processing of antigens, the structure, production and diversity of antibodies, the operation of the complement system and mechanisms for recognition and destruction of invading microbes. The unit concludes with an overview of microbial diseases, the characteristics of causative agents, pathogenesis and symptoms as well as treatment and control and culminates with exploring current issues of antibiotic resistance, important emerging infections and vaccination strategies.

Practical classes illustrate and underpin the lecture content. Students will investigate normal flora, host defences and medically important microbes and will obtain experience in, and an understanding of, a range of techniques in bacteriology. In these practical sessions experience will be gained handling live, potentially pathogenic microbes.

Textbooks
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
Basic Immunology: Functions and Disorders of the Immune System. Abass AK and Lichtman AH WB Saunders, 4th Edition, 2013
Robbins Basic Pathology Kumar V, Abbas AK and Aster J Saunders, Philadelphia, 9th Edition, 2013

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1 **Assessment:** Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks
Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

MEDS2004 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

Selective

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for

cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901

Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

IMMU2X11 and MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Core

IMMU3102

Molecular and Cellular Immunology

Credit points: 6 **Teacher/Coordinator:** A/Prof Carl Feng **Session:** Semester 2 **Classes:** Three 1 hour lectures, one tutorial and one 4-hour practical per fortnight. **Prerequisites:** IMMU2101 or (BMED2401 and BMED2404) **Prohibitions:** IMMU3902 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This study unit builds on the series of lectures that outlined the general properties of the immune system, effector lymphocytes and their functions, delivered in the core courses, IMMU2101 - Introductory Immunology and BMED2404 - Microbes, Infection and Immunity (formerly IMMU2001 and BMED2807). In this unit the molecular and cellular aspects of the immune system are investigated in detail. We emphasise fundamental concepts to provide a scientific basis for studies of the coordinated and regulated immune responses that lead to elimination of infectious organisms. Guest lectures from research scientists eminent in particular branches of immunological research are a special feature of the course. These provide challenging information from the forefront of research that will enable the student to become aware of the many components that come under the broad heading 'Immunology'. Three lectures (1 hour each) will be given each fortnight: 2 lectures in one week and one lecture the following week, for the duration of the course. This unit directly complements the unit 'Immunology in Human Disease IMMU3202' and students are very strongly advised to undertake these study units concurrently.

Textbooks

Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier.

IMMU3902

Molecular and Cellular Immunology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Carl Feng **Session:** Semester 2 **Classes:** 3 lectures, 1 special seminar/tutorial (2 hours), 1 practical (4 hours) every 2 weeks. **Prerequisites:** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **Prohibitions:** IMMU3102 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Introductory Immunology (IMMU2101). Advanced students will complete the same core lecture material as students in IMMU3102 but carry out advanced level practical work and a series of specialized seminar based tutorial classes.

Textbooks

Textbooks Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier.

IMMU3202

Immunology in Human Disease

Credit points: 6 **Teacher/Coordinator:** A/Prof Allison Abendroth **Session:** Semester 2 **Classes:** Three 1 hour lectures, one tutorial and one 4 hour practical per fortnight. **Prerequisites:** IMMU2101 or (BMED2401 and BMED2404) **Prohibitions:** IMMU3903 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This study unit builds on the series of lectures that outlined the general properties of the immune system, effector lymphocytes and their functions, delivered in the core courses, IMMU2101 - Introductory Immunology and BMED2404 - Microbes, Infection and Immunity (formerly IMMU2001 and BMED2807). We emphasise fundamental concepts to provide a scientific basis for studies in clinical immunology; dysfunctions of the immune system e.g. autoimmune disease, immunodeficiencies, and allergy, and immunity in terms of host - pathogen interactions. This unit has a strong focus on significant clinical problems in immunology and the scientific background to these problems. The unit includes lectures from research scientists and clinicians covering areas such as allergy, immunodeficiency, autoimmune disease and transplantation. This course provides challenging information from the forefront of clinical immunology and helps the student develop an understanding of immune responses in human health and disease. Three lectures (1 hour each) will be given each fortnight: 2 lectures in one week and one lecture the following week, for the duration of the course. This unit directly complements the unit 'Molecular and Cellular Immunology IMMU3102' and students are very strongly advised to undertake these study units concurrently.

Textbooks

Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier

IMMU3903
Immunology in Human Disease (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Allison Abendroth **Session:** Semester 2 **Classes:** 3 lectures,1 seminar/tutorial (2 hours) and1 practical (4 hours) every 2 weeks. **Prerequisites:** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **Prohibitions:** IMMU3202 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Introductory Immunology (IMMU2101). Advanced students will complete the same core lecture material as students in IMMU3202 but carry out advanced level practical work and a series of specialized seminar based tutorial classes.

Textbooks

Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier

IMMU3X11 and IMMU3X12 to be developed for offering in 2019.

Infectious Diseases

Study in Infectious Diseases is offered in partnership between the Discipline of Infectious Diseases and Immunology in the Sydney Medical School and the Discipline of Microbiology in the School of Life and Environmental Sciences in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

Infectious diseases occur as a result of interactions between microbial pathogens and their hosts. The Infectious Diseases major is a multidisciplinary pathway of study that emphasizes how infectious agents interact with human hosts at the molecular, cellular, individual patient and community levels to cause disease.

This major begins with developing an understanding of the relevance of infectious diseases within the concept of ‘One Health’ in which the multifactorial interrelationships between human, animal and environmental health are critical. Central is the context of microbes: bacteria, viruses, fungi and protists being beneficial for good health as well as effective causative agents of disease. The structural and functional cellular and molecular mechanisms that enable establishment and progression of infectious diseases are covered with a particular focus on pathogens: microbial virulence mechanisms; their capacity to evade the human response to injury and infection; their ability to cause tissue damage; their resistance to antimicrobial therapy and the development of new tools to control infectious agents. This progresses to explore patterns of incidence and the epidemiology of outbreaks of infectious diseases within communities.

Requirements for completion

A major in Infectious Diseases requires 48 credit points, consisting of:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level selective units
(iii)12 credit points of 2000-level core units
(iv)24 credit points of 3000-level core units

A minor in Infectious Diseases is available and articulates to this major.

First year

BIOL1XX7 From Molecules to Ecosystems and 6 credit points from a selection of: CHEM1XX1 Chemistry or BIOL1XX8 or MEDS1X01 Human Biology (MEDS1X01 is only available to students enrolled in the Medical Science stream, students outside the Medical Science stream take BIOL1XX8).

Second year

IMMU2101 Immunology (MIMI2X02 in 2019) and MICR2X22 Microbes in Society OR for students enrolled in the Medical Science stream only: BMED2404 (MEDS2004 in 2019), BMED2405 (MEDS2003 in 2019).

Third year

Core: INFD3012, MICR3X11, VIRO3X01, VIRO3X02.

In your third year you must take at least one designated project unit.

The final year culminates with a focus on the interdisciplinary nature of the Infectious Diseases major by embracing study of microbial causative agents, outbreak epidemiology and host response. Central to this lies the impacts and outcomes of infection with microbial pathogens for humans and other hosts: animals and plants.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework

The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Infectious Diseases: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/medicine/infectious-diseases-immunology/contact/index.php

Address:
Infectious Diseases and Immunology
Level 5 (East), Charles Perkins Centre hub (D17)
University of Sydney NSW 2006

Ms Helen Agus
E helen.agus@sydney.edu.au
T +61 2 9351 6043

Dr Jamie Triccas
E jamie.triccas@sydney.edu.au
T +61 2 9036 6582

Learning Outcomes

Students who graduate from Infectious Diseases will be able to:

1. Describe the role of microbes as agents of disease, their function in the ecosphere, abundance and diversity
2. Define the key characteristics of the classes of microbes that distinguish them from each other
3. Perform culture, microscopy, diagnostic and molecular techniques used in the modern diagnostic microbiology and infectious diseases laboratory, and explain and critically evaluate the scientific principles behind these important infectious disease techniques
4. Have a detailed knowledge of microbial virulence mechanisms and their role in invasion, establishment and progression of infection
5. Know the major causes of important infectious diseases in the general community and hospital environments
6. Explain how infectious diseases emerge or re-emerge to impact human and global health
7. Explain the ways in which important microbial pathogens pose a challenge for public health
8. Be familiar with the measures that have been developed to control infectious agents and the conceptual basis of the control strategies
9. Critically evaluate the research literature dealing with pathogenic processes of infectious organisms and epidemiology and apply this knowledge to infectious disease research.

Infectious Diseases

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
INFECTIOUS DISEASES			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Infectious Diseases major			
A major in Infectious Diseases requires 48 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units (iv) 24 credit points of 3000-level core units			
Infectious Diseases minor			
A minor in Infectious Diseases requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units (iv) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Selective			
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			
2000-level units of study			
Core			
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
BMED2405 **Gut and Nutrient Metabolism**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
MICR2022 **Microbes in Society**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **N** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
MICR2922 **Microbes in Society (Advanced)**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
MIMI2X02, MEDS2003 and MEDS2004 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Major core			
INFD3012 **Infectious Diseases**	6	**P** BMED2401 and BMED2404 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3011 **Microbes in Infection**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **N** MICR3911 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
MICR3911 **Microbes in Infection (Advanced)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** MICR3011	Semester 1
VIRO3001 **Virology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3901 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
VIRO3901 **Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** VIRO3001 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
VIRO3002 **Medical and Applied Virology**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3902 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.*	Semester 2
VIRO3902 **Medical and Applied Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **N** VIRO3002 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.*	Semester 2
Minor core			
INFD3012 **Infectious Diseases**	6	**P** BMED2401 and BMED2404 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3011 **Microbes in Infection**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **N** MICR3911 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
MICR3911 **Microbes in Infection (Advanced)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** MICR3011	Semester 1

Virology Minor

A minor in Virology requires 36 credit points from this table including:

(i) 6 credit points of 1000-level core units

(ii) 6 credit points of 1000-level selective units

(iii) 12 credit points of 2000-level core units

(iv) 12 credit points of 3000-level core units

Units of study

The units of study for the Virology minor are listed below

1000-level units of study

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Selective			
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			
2000-level units of study			
Core			
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
BMED2405 **Gut and Nutrient Metabolism**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
MICR2022 **Microbes in Society**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **N** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
MICR2922 **Microbes in Society (Advanced)**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
MIMI2X02, MEDS2003 and MEDS2004 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Core			
VIRO3001 **Virology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3901 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
VIRO3901 **Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** VIRO3001 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
VIRO3002 **Medical and Applied Virology**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3902 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.*	Semester 2
VIRO3902 **Medical and Applied Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **N** VIRO3002 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.*	Semester 2

Infectious Diseases

INFECTIOUS DISEASES

Advanced coursework and projects will be available in 2020 for students who complete this major.

Infectious Diseases major

A major in Infectious Diseases requires 48 credit points from this table including:(i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level selective units(iii) 12 credit points of 2000-level core units(iv) 24 credit points of 3000-level core units

Infectious Diseases minor

A minor in Infectious Diseases requires 36 credit points from this table including:(i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level selective units(iii) 12 credit points of 2000-level core units (iv) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

Selective

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks
TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Core

BMED2404
Microbes, Infection and Immunity

Credit points: 6 **Teacher/Coordinator:** Dr Jim Manos **Session:** Semester 2 **Classes:** Two lectures and one practical per week, two tutorials **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), in-semester assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study begins by introducing the concepts of disease transmission, pathogenicity and virulence mechanisms of microbes. For a full understanding of the process of infection, the structure and function of pathogenic microorganisms is examined. How the body deals with injury and infection is discussed by exploring barriers to infection and host response once those barriers are breached. The body's response to such physical damage is dealt with in a series of lectures on wound healing, clotting and inflammation, and is complemented by discussion of the pharmacological basis of anti-inflammatory drugs. This is followed by a comprehensive discussion of molecular and cellular immune responses to pathogen invasion. In particular, this gives students an appreciation of the processing of antigens, the structure, production and diversity of antibodies, the operation of the complement system and mechanisms for recognition and destruction of invading microbes. The unit concludes with an overview of microbial diseases, the characteristics of causative agents, pathogenesis and symptoms as well as treatment and control and culminates with exploring current issues of antibiotic resistance, important emerging infections and vaccination strategies.

Practical classes illustrate and underpin the lecture content. Students will investigate normal flora, host defences and medically important microbes and will obtain experience in, and an understanding of, a range of techniques in bacteriology. In these practical sessions experience will be gained handling live, potentially pathogenic microbes.

Textbooks
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
Basic Immunology: Functions and Disorders of the Immune System. Abass AK and Lichtman AH WB Saunders, 4th Edition, 2013
Robbins Basic Pathology Kumar V, Abbas AK and Aster J Saunders, Philadelphia, 9th Edition, 2013

BMED2405
Gut and Nutrient Metabolism

Credit points: 6 **Teacher/Coordinator:** A/Prof Charles Collyer **Session:** Semester 2 **Classes:** Two lectures and one tutorial or one practical session per week **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), five in-semester assignments/assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines in detail the anatomy of the gastrointestinal tract, from the oral cavity to anal canal, and includes the liver, gallbladder and pancreas. This is complemented by description of the specialised cells in the gastrointestinal tract, followed by discussion of the transport mechanisms employed to absorb nutrients, and consideration of control systems used to regulate activity of the digestive process. The role of intestinal microflora in the gastrointestinal tract, contributing to both beneficial digestion and absorption of nutrients, as well as to pathogenic disruption, is also discussed. The fate of the macronutrients (carbohydrate, fat and protein) is then considered in terms of their uptake, disposal and reassembly into storage fuels and cellular structures. The biochemical pathways involved in the extraction of energy from the macronutrient fuels are then covered. Examples of these metabolic processes are provided by considering fuel selection during starvation and in diabetes. Finally, pharmacokinetics and pharmacogenomics are explored, with discussion of the metabolism and absorption of drugs including detoxification and excretion of xenobiotic compounds. Practical classes give students extensive experience with inspection of the gastrointestinal system at both the cellular and gross anatomical levels, and in theassay of biochemicals such as glucose. These sessions are designed to nurture observation, data analysis, record keeping and report writing skills.

Textbooks
Human Physiology: An integrated approach Silverthorn D Pearson/Benjamin Cummings, 6th Edition, 2013
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
The Anatomy Coloring Book Kapit W and Elson LM Benjamin Cummings, 4th Edition, 2014
Histology: A text and Atlas Ross MH and Pawlina W Lippincott, Williams and Wilkins, 7th Edition, 2015
Medical Pharmacology at a Glance Neal MJ Blackwell Science, 7th Edition, 2012

Textbook of Biochemistry with Clinical Correlations Devlin TM John Wiley and Sons Inc., 7th Edition, 2011

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1 **Assessment:** Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks

Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

MICR2022
Microbes in Society

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials per semester. Eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **Prohibitions:** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, two assignments, one quiz, one practical exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

Pathogenic microbes cause infectious diseases of humans, animals and plants, and inflict enormous suffering and economic losses. Beneficial microbes are important contributors to food production, agriculture, biotechnology, and environmental processes. The aims of MICR2022/2922 are to explore the impacts and applications of microbes in human society and in the environment at large, and to teach skills and specialist knowledge in several key areas of microbiology. Medical Microbiology lectures will cover bacterial, viral, and fungal pathogens, and will introduce the concepts of epidemiology, transmission, pathogenicity, virulence factors, host/parasite relationships, host defences, prevention of disease, and antibiotic types, functions, and resistance. Lecture topics in other areas include Food (preservation, spoilage, poisoning, industrial context), Industrial (fermentation, traditional and recombinant products, bioprospecting), Environmental (nutrient cycles, atmosphere, wastewater, pollution, biodegradation) and Agricultural (nitrogen fixation, plant pathogens, biocontrol) microbiology. The laboratory sessions are integrated with the lecture series and are designed to give students practical experience in isolating, identifying and manipulating live potentially pathogenic microorganisms.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

MICR2922
Microbes in Society (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials, three 1-hour seminars and eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, one assignment, one quiz, one practical exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

This unit of study is based on MICR2022. A science communication exercise is unique to MICR2922 and consists of three small group sessions exploring how recent advances in microbiology are communicated to the wider public. This advanced component replaces one assignment exercise from the practical class and is assessed as short essay. The content and nature of this component is based on recent publications with potential high impact for society.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

MIMI2X02, MEDS2003 and MEDS2004 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Major core

INFD3012
Infectious Diseases

Credit points: 6 **Teacher/Coordinator:** A/Prof Jamie Triccas **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 4 hour practical class per week. **Prerequisites:** BMED2401 and BMED2404 **Assessment:** Formal examination (60%): one 2 hour exam. Progressive assessment (40%): includes tutorial case presentation, mid-semester quiz and practical assessment. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Infectious diseases occur as a result of interactions between a host and a microbial parasite. This unit of study will explain how infectious agents interact with human hosts at the molecular, cellular, individual patient and community levels to cause diseases and how the hosts attempt to combat these infections. The unit will be taught by the discipline of Infectious Diseases and Immunology of the Department of Medicine within the Central Clinical School, Faculty of Medicine with involvement of associated clinical and research experts who will contribute lectures and theme sessions on their own special interests. The unit will integrate lectures with clinical case studies and hands-on practical sessions to provide students with current knowledge of infectious diseases.

Textbooks

Infectious Diseases: Pathogenesis, Prevention and Case Studies. Edited by Shetty et al. Wiley-Blackwell 2009. ISBN 9781405135436.

MICR3011
Microbes in Infection

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **Prohibitions:** MICR3911 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 2-hour exam; Practical (40%): case study: worksheet, lab work, presentation;

one quiz; one 1-hour theory of prac exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The practical component is designed to enhance students' practical skills and to complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR et al. Medical Microbiology. 8th edition. Mosby. 2016.

MICR3911
Microbes in Infection (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week including six 1-hour tutorials, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester. **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** MICR3011 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1.5-hour exam (45%), one essay, one in-semester exam; Practical (40%): case study: worksheet, lab work, presentation; quiz; one 1-hour theory of prac exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is available to students who have performed well in Intermediate Microbiology. This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The unique aspect of this advanced unit that differentiates it from the mainstream unit is six tutorial style sessions that replace six mainstream lectures in the theme 'Emerging and re-emerging diseases'. These dedicated research-led interactive advanced sessions support self-directed learning and involve discussion around specific topics that will vary from year to year. Nominated research papers and reviews in the topic area will be explored with supported discussion of the relevance to and impact of the work on current thinking around emergence of microbial disease. The focus will be on microbial change that lies critically at the centre of understanding the reasons for the emergence of new diseases and challenges in an era of significant scientific ability to diagnose and treat infection. The practical component is identical to the mainstream unit and is designed to enhance students' practical skills and to complement the lectures. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR.et al. Medical Microbiology. 8th ed., Mosby, 2016

VIRO3001
Virology

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 26 1-hour lectures, seven 4-hour practical classes, one 2-hour tutorial **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3901 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam (60%) (120 minutes). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novel vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluorescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Tutorials cover a range of topical issues and provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3901
Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 29 1-hour lectures, seven 4-hour practical classes, four 1-hour tutorials **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** VIRO3001 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), individual presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam: (60%) (120 minutes) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Intermediate Microbiology and is based on VIRO3001 with additional lectures related to the research interests in the Discipline. Consequently, the unit of study content may change from year to year. Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novle vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluroescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Advanced lectures cover cutting-edge research in the field of virology in small group discussions and presentations that provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3002
Medical and Applied Virology

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1-hour lectures per week **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3902 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment and oral presentation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. Practical session slots are also used for oral presentations. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.

This unit of study explores diseases in human caused by viruses, with focus on the way viruses infect individual patients and spread in the community, and how virus infections are diagnosed, treated and/or prevented. Host/Virus interactions will also be described with a focus on the viral mechanisms that have evolved to combat and/or evade host defence systems. These features will be used to explain the symptoms, spread and control of the most medically important viruses that cause serious disease in humans . The unit will be taught by the Discipline of Infectious Diseases and Immunology within the Sydney Medical School with the involvement of associated clinical and research experts who will contribute lectures on their own special interests and with contributions from the Discipline of Microbiology. In the practical classes students will have the opportunity to develop their skills in performing methods currently used in diagnostic and research laboratories such as molecular analysis of viral genomes, immunofluorescent staining of viral antigens, cell culture and the culture of viruses.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3902
Medical and Applied Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, and one interactive 2-hour tutorials (approx 6 in total, including for oral presentations) **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **Prohibitions:** VIRO3002 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment, oral presentation and tutorial participation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.

This unit is based on the VIRO3002 course with inclusion of tutorials, including with leading research medical virologists, enabling students to gain additional experience with cutting edge virology research. The content of this unit may change from year to year based on research interests within the department.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

Minor core

INFD3012
Infectious Diseases

Credit points: 6 **Teacher/Coordinator:** A/Prof Jamie Triccas **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 4 hour practical class per week. **Prerequisites:** BMED2401 and BMED2404 **Assessment:** Formal examination (60%): one 2 hour exam. Progressive assessment (40%): includes tutorial case presentation, mid-semester quiz and practical assessment. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Infectious diseases occur as a result of interactions between a host and a microbial parasite. This unit of study will explain how infectious agents interact with human hosts at the molecular, cellular, individual patient and community levels to cause diseases and how the hosts attempt to combat these infections. The unit will be taught by the discipline of Infectious Diseases and Immunology of the Department of Medicine within the Central Clinical School, Faculty of Medicine with involvement of associated clinical and research experts who will contribute lectures and theme sessions on their own special interests. The unit will integrate lectures with clinical case studies and hands-on practical sessions to provide students with current knowledge of infectious diseases.

Textbooks

Infectious Diseases: Pathogenesis, Prevention and Case Studies. Edited by Shetty et al. Wiley-Blackwell 2009. ISBN 9781405135436.

MICR3011
Microbes in Infection

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **Prohibitions:** MICR3911 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 2-hour exam; Practical (40%): case study: worksheet, lab work, presentation; one quiz; one 1-hour theory of prac exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The practical component is designed to enhance students' practical skills and to complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR et al. Medical Microbiology. 8th edition. Mosby. 2016.

MICR3911
Microbes in Infection (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week including six 1-hour tutorials, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester. **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** MICR3011 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1.5-hour exam (45%), one essay, one in-semester exam; Practical (40%): case study: worksheet, lab work, presentation; quiz; one 1-hour theory of prac exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is available to students who have performed well in Intermediate Microbiology. This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The unique aspect of this advanced unit that differentiates it from the mainstream unit is six tutorial style sessions that replace six mainstream lectures in the theme 'Emerging and re-emerging diseases'. These dedicated research-led interactive advanced sessions support self-directed learning and involve discussion around specific topics that will vary from year to year. Nominated research papers and reviews in the topic area will be explored with supported discussion of the relevance to and impact of the work on current thinking around emergence of microbial disease. The focus will be on microbial change that lies critically at the centre of understanding the reasons for the emergence of new diseases and challenges in an era of significant scientific ability to diagnose and treat infection. The practical component is identical to the mainstream unit and is designed to enhance students' practical skills and to complement the lectures. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR.et al. Medical Microbiology. 8th ed., Mosby, 2016

Virology Minor

A minor in Virology requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units(iv) 12 credit points of 3000-level core units

Units of study

The units of study for the Virology minor are listed below

1000-level units of study

Core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

Selective

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks
TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Core

BMED2404
Microbes, Infection and Immunity

Credit points: 6 **Teacher/Coordinator:** Dr Jim Manos **Session:** Semester 2 **Classes:** Two lectures and one practical per week, two tutorials **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), in-semester assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study begins by introducing the concepts of disease transmission, pathogenicity and virulence mechanisms of microbes. For a full understanding of the process of infection, the structure and function of pathogenic microorganisms is examined. How the body deals with injury and infection is discussed by exploring barriers to infection and host response once those barriers are breached. The body's response to such physical damage is dealt with in a series of lectures on wound healing, clotting and inflammation, and is complemented by discussion of the pharmacological basis of anti-inflammatory drugs. This is followed by a comprehensive discussion of molecular and cellular immune responses to pathogen invasion. In particular, this gives students an appreciation of the processing of antigens, the structure, production and diversity of antibodies, the operation of the complement system and mechanisms for recognition and destruction of invading microbes. The unit concludes with an overview of microbial diseases, the characteristics of causative agents, pathogenesis and symptoms as well as treatment and control and culminates with exploring current issues of antibiotic resistance, important emerging infections and vaccination strategies.

Practical classes illustrate and underpin the lecture content. Students will investigate normal flora, host defences and medically important microbes and will obtain experience in, and an understanding of, a range of techniques in bacteriology. In these practical sessions experience will be gained handling live, potentially pathogenic microbes.

Textbooks
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
Basic Immunology: Functions and Disorders of the Immune System. Abass AK and Lichtman AH WB Saunders, 4th Edition, 2013
Robbins Basic Pathology Kumar V, Abbas AK and Aster J Saunders, Philadelphia, 9th Edition, 2013

BMED2405
Gut and Nutrient Metabolism

Credit points: 6 **Teacher/Coordinator:** A/Prof Charles Collyer **Session:** Semester 2 **Classes:** Two lectures and one tutorial or one practical session per week **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), five in-semester assignments/assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines in detail the anatomy of the gastrointestinal tract, from the oral cavity to anal canal, and includes the liver, gallbladder and pancreas. This is complemented by description of the specialised cells in the gastrointestinal tract, followed by discussion of the transport mechanisms employed to absorb nutrients, and consideration of control systems used to regulate activity of the digestive process. The role of intestinal microflora in the gastrointestinal tract, contributing to both beneficial digestion and absorption of nutrients, as well as to pathogenic disruption, is also discussed. The fate of the macronutrients (carbohydrate, fat and protein) is then considered in terms of their uptake, disposal and reassembly into storage fuels and cellular structures. The biochemical pathways involved in the extraction of energy from the macronutrient fuels are then covered. Examples of these metabolic processes are provided by considering fuel selection during starvation and in diabetes. Finally, pharmacokinetics and pharmacogenomics are explored, with discussion of the metabolism and absorption of drugs including detoxification and excretion of xenobiotic compounds. Practical classes give students extensive experience with inspection of the gastrointestinal system at both the cellular and gross anatomical levels, and in theassay of biochemicals such as glucose. These sessions are designed to nurture observation, data analysis, record keeping and report writing skills.

Textbooks

Human Physiology: An integrated approach Silverthorn D Pearson/Benjamin Cummings, 6th Edition, 2013
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
The Anatomy Coloring Book Kapit W and Elson LM Benjamin Cummings, 4th Edition, 2014
Histology: A text and Atlas Ross MH and Pawlina W Lippincott, Williams and Wilkins, 7th Edition, 2015
Medical Pharmacology at a Glance Neal MJ Blackwell Science, 7th Edition, 2012
Textbook of Biochemistry with Clinical Correlations Devlin TM John Wiley and Sons Inc., 7th Edition, 2011

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1 **Assessment:** Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks

Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

MICR2022
Microbes in Society

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials per semester. Eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **Prohibitions:** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, two assignments, one quiz, one practical exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

Pathogenic microbes cause infectious diseases of humans, animals and plants, and inflict enormous suffering and economic losses. Beneficial microbes are important contributors to food production, agriculture, biotechnology, and environmental processes. The aims of MICR2022/2922 are to explore the impacts and applications of microbes in human society and in the environment at large, and to teach skills and specialist knowledge in several key areas of microbiology. Medical Microbiology lectures will cover bacterial, viral, and fungal pathogens, and will introduce the concepts of epidemiology, transmission, pathogenicity, virulence factors, host/parasite relationships, host defences, prevention of disease, and antibiotic types, functions, and resistance. Lecture topics in other areas include Food (preservation, spoilage, poisoning, industrial context), Industrial (fermentation, traditional and recombinant products, bioprospecting), Environmental (nutrient cycles, atmosphere, wastewater, pollution, biodegradation) and Agricultural (nitrogen fixation, plant pathogens, biocontrol) microbiology. The laboratory sessions are integrated with the lecture series and are designed to give students practical experience in isolating, identifying and manipulating live potentially pathogenic microorganisms.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

MICR2922
Microbes in Society (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials, three 1-hour seminars and eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, one assignment, one quiz, one practical exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

This unit of study is based on MICR2022. A science communication exercise is unique to MICR2922 and consists of three small group sessions exploring how recent advances in microbiology are communicated to the wider public. This advanced component replaces one assignment exercise from the practical class and is assessed as short essay. The content and nature of this component is based on recent publications with potential high impact for society.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

MIMI2X02, MEDS2003 and MEDS2004 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Core

VIRO3001
Virology

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 26 1-hour lectures, seven 4-hour practical classes, one 2-hour tutorial **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3901 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam (60%) (120 minutes). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have *successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*

Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novel vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluorescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Tutorials cover a range of topical issues and provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3901
Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 29 1-hour lectures, seven 4-hour practical classes, four 1-hour tutorials **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** VIRO3001 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), individual presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam: (60%) (120 minutes) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Intermediate Microbiology and is based on VIRO3001 with additional lectures related to the research interests in the Discipline. Consequently, the unit of study content may change from year to year. Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novle vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluroescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Advanced lectures cover cutting-edge research in the field of virology in small group discussions and presentations that provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3002
Medical and Applied Virology

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1-hour lectures per week **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3902 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment and oral presentation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. Practical session slots are also used for oral presentations. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.

This unit of study explores diseases in human caused by viruses, with focus on the way viruses infect individual patients and spread in the community, and how virus infections are diagnosed, treated and/or prevented. Host/Virus interactions will also be described with a focus on the viral mechanisms that have evolved to combat and/or evade host defence systems. These features will be used to explain the symptoms, spread and control of the most medically important viruses that cause serious disease in humans . The unit will be taught by the Discipline of Infectious Diseases and Immunology within the Sydney Medical School with the involvement of associated clinical and research experts who will contribute lectures on their own special interests and with contributions from the Discipline of Microbiology. In the practical classes students will have the opportunity to develop their skills in performing methods currently used in diagnostic and research laboratories such as molecular analysis of viral genomes, immunofluorescent staining of viral antigens, cell culture and the culture of viruses.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3902
Medical and Applied Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, and one interactive 2-hour tutorials (approx 6 in total, including for oral presentations) **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **Prohibitions:** VIRO3002 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment, oral presentation and tutorial participation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.

This unit is based on the VIRO3002 course with inclusion of tutorials, including with leading research medical virologists, enabling students to gain additional experience with cutting edge virology research. The content of this unit may change from year to year based on research interests within the department.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

Information Systems

The School of Information Technologies aims to teach fundamental principles and practical skills in IT, and to establish the foundations for an entire career. Units of study in Information Systems major are available at standard and advanced level.

About the major

Information Systems is the study of people and organisations in order to determine and deliver solutions that meet their technological needs. Hence Information Systems deals with the following type of issues: strategic planning, system development, system implementation, operational management, end-user needs and education.

Information Systems study is related to Computer Science but the crucial distinction is that Information Systems is about making computer systems work to optimise the productivity and efficiency of organisations, whereas much of Computer Science is about developing software technologies to solve problems, which can improve quality of life and enhance delivery of service.

The school's research in Information Systems encompasses natural language processing, IT economics, social networking analysis, ontology design, data mining and analysis, and knowledge management and open source software.

Requirements for completion

A major in Information Systems requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)18 credit points of 2000-level core units
(iii)18 credit points of 3000-level core units, including 1 interdisciplinary project unit

A minor in Information Systems is available and articulates to this major.

First year

Core: INFO1110 and INFO1113.

Second year

Core: ISYS2120, ISYS2110, ISYS2160.

Third year

Core: ISYS3401, ISYS3402, ISYS3400.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Information Systems: completion of 24 credit points of project work and 24 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W https://sydney.edu.au/engineering/about/school-of-information-technologies.html

E info@it.usyd.edu.au
T +61 2 9351 3423

Address:
School of Information Technologies J12
University of Sydney NSW 2006

Dr Josiah Poon
T +61 2 9351 7185
E josiah.poon@sydney.edu.au

Learning Outcomes

Students who graduate from Information Systems will be able to:

1. Develop a good understanding of the broader socio-technical systems in which the computer and communications systems are embedded.
2. Carry out detailed information requirements analyses to elicit system requirements
3. Develop the skills to design and implement information systems
4. Have a thorough understanding of the challenges in implementing information systems
5. Have the skills and capabilities to plan and manage information systems projects
6. Acquire the ability to work effectively in teams and to communicate with the diverse stakeholders
7. Have sound knowledge of, and the skills to apply, a range of system development methods
8. Be equipped with applied research skills, which will enable them to undertake a wide range of investigations
9. Learn how to acquire the relevant data and to analyse the data to arrive at valid inferences.

Information Systems

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
INFORMATION SYSTEMS			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Information Systems major			
A major in Information Systems requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units, including 1 interdisciplinary project unit			
Information Systems minor			
A minor in Information Systems requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 6 credit points of 3000-level selective unit			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
INFO1110 **Introduction to Programming**	6		Intensive July Semester 1 Semester 2
INFO1113 **Object-Oriented Programming**	6	**P** INFO1110 **N** INFO1103 OR INFO1105 OR INFO1905	Semester 1 Semester 2
2000-level units of study			
Core			
ISYS2120 **Data and Information Management**	6	**A** Programming skills **P** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 OR INFO1003 OR INFO1903 OR DECO1012 **N** INFO2120 OR INFO2820 OR COMP5138	Semester 2
ISYS2110 **Analysis and Design of Web Info Systems**	6	**P** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 **N** INFO2110	Semester 1
ISYS2160 **Information Systems in the Internet Age**	6	**A** INFO1003 OR INFO1103 OR INFO1903 OR INFO1113 **N** ISYS2140	Semester 2
3000-level units of study			
Major core			
ISYS3401 **Information Technology Evaluation**	6	**P** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160)	Semester 1
ISYS3402 **Decision Analytics and Support Systems**	6	**A** Database Management AND Systems Analysis and Modelling **P** (ISYS2110 OR INFO2110) AND (ISYS2120 OR INFO2120)	Semester 2
ISYS3400 **Information Systems Project**	6	**P** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160) **N** INFO3600 or ISYS3207	Semester 2
Minor selective			
ISYS3401 **Information Technology Evaluation**	6	**P** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160)	Semester 1
ISYS3402 **Decision Analytics and Support Systems**	6	**A** Database Management AND Systems Analysis and Modelling **P** (ISYS2110 OR INFO2110) AND (ISYS2120 OR INFO2120)	Semester 2

Information Systems

INFORMATION SYSTEMS

Advanced coursework and projects will be available in 2020 for students who complete this major.

Information Systems major

A major in Information Systems requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 18 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units, including 1 interdisciplinary project unit

Information Systems minor

A minor in Information Systems requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 18 credit points of 2000-level core units(iii) 6 credit points of 3000-level selective unit

Units of study

The units of study are listed below.

1000-level units of study

Core

INFO1110
Introduction to Programming

Credit points: 6 **Session:** Intensive July, Semester 1, Semester 2 **Classes:** lectures, laboratories, seminars **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an essential starting point for software developers, IT consultants, and computer scientists to build their understanding of principle computer operation. Students will obtain knowledge and skills with procedural programming. Crucial concepts include defining data types, control flow, iteration, functions, recursion, the model of addressable memory. Students will be able to reinterpret a general problem into a computer problem, and use their understanding of the computer model to develop source code. This unit trains students with software development process, including skills of testing and debugging. It is a prerequisite for more advanced programming languages, systems programming, computer security and high performance computing.

INFO1113
Object-Oriented Programming

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** lectures, laboratories, seminars **Prerequisites:** INFO1110 **Prohibitions:** INFO1103 OR INFO1105 OR INFO1905 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Object-oriented (OO) programming is a technique that arranges code into classes, each encapsulating in one place related data and the operations on that data. Inheritance is used to reuse code from a more general class, in specialised situations. Most modern programming languages provide OO features. Understanding and using these are an essential skill to software developers in industry. This unit provides the student with the concepts and individual programming skills in OO programming, starting from their previous mastery of procedural programming.

2000-level units of study

Core

ISYS2120
Data and Information Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials, Laboratories, Project Work - own time **Prerequisites:** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 OR INFO1003 OR INFO1903 OR DECO1012 **Prohibitions:** INFO2120 OR INFO2820 OR COMP5138 **Assumed knowledge:** Programming skills **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The ubiquitous use of information technology leaves us facing a tsunami of data produced by users, IT systems and mobile devices. The proper management of data is hence essential for all applications and for effective decision making within organizations.

This unit of study will introduce the basic concepts of database designs at the conceptual, logical and physical levels. We will place particular emphasis on introducing integrity constraints and the concept of data normalization which prevents data from being corrupted or duplicated in different parts of the database. This in turn helps in the data remaining consistent during its lifetime. Once a database design is in place, the emphasis shifts towards querying the data in order to extract useful information. The unit will introduce the SQL database query languages, which is industry standard. Other topics covered will include the important concept of transaction management, application development with a backend database, and an overview of data warehousing and OLAP.

ISYS2110
Analysis and Design of Web Info Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, tutorials **Prerequisites:** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 **Prohibitions:** INFO2110 **Assessment:** through semester assessment (40%), final exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course discusses the processes, methods, techniques and tools that organisations use to determine how they should conduct their business, with a particular focus on how web-based technologies can most effectively contribute to the way business is organized. The course covers a systematic methodology for analysing a business problem or opportunity, determining what role, if any, web-based technologies can play in addressing the business need, articulating business requirements for the technology solution, specifying alternative approaches to acquiring the technology capabilities needed to address the business requirements, and specifying the requirements for the information systems solution in particular, in-house development, development from third-party providers, or purchased commercial-off-the-shelf (COTS) packages.

ISYS2160
Information Systems in the Internet Age

Credit points: 6 **Session:** Semester 2 **Classes:** lectures, tutorials **Prohibitions:** ISYS2140 **Assumed knowledge:** INFO1003 OR INFO1103 OR INFO1903 OR INFO1113 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive conceptual and practical introduction to information systems (IS) in the Internet era. Key topics covered include: system thinking and system theory, basic concepts of information systems, internet and e-commerce, e-payment and m-commerce, online marketing and social media, information systems for competitive advantage, functional and enterprise systems, business intelligence, information systems development and acquisition, information security, ethics, and privacy

3000-level units of study

Major core

ISYS3401
Information Technology Evaluation

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160) **Assessment:** Through semester assessment (35%) and Final Exam (65%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Information Systems (IS) professionals in today's organisations are required to play leadership roles in change and development. Your success in this field will be aided by your being able to carry out research-based investigations using suitable methods and mastery over data collection and analysis to assist in managing projects and in decision making. Practical research skills are some of the most important assets you will need in your career.

This unit of study will cover important concepts and skills in practical research for solving and managing important problems. This will also provide you with the skills to undertake the capstone project in the IS project unit of study offered in Semester 2 or other projects. It will also provide hand-on experience of using Microsoft Excel and other tools to perform some of the quantitative analysis.

ISYS3402
Decision Analytics and Support Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** (ISYS2110 OR INFO2110) AND (ISYS2120 OR INFO2120) **Assumed knowledge:** Database Management AND Systems Analysis and Modelling **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

With the rapid increases in the volume and variety of data available, the problem of providing effective support to facilitate good decision making has become more challenging. This unit of study will provide a comprehensive understanding the diverse types of decision and the decision making processes. It will introduce decision modelling and the design and implementation of application systems to support decision making in organisational contexts. It will include a range of business intelligence and analytics solutions based on online analytical processing (OLAP) models and technologies. The unit will also cover a number of modelling approaches (optimization, predictive, descriptive) and their integration in the context of enabling improved, data-driven decision making.

ISYS3400
Information Systems Project

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class, Project Work - own time, Site Visits, Meetings **Prerequisites:** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160) **Prohibitions:** INFO3600 or ISYS3207 **Assessment:** Through semester assessment (80%) and Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide students an opportunity to apply the knowledge and practise the skills acquired in the prerequisite and qualifying units, in the context of a substantial information systems research or development project and to experience in a realistic way many aspects of analysing and solving information systems problems. Since information systems projects are often undertaken by small teams, the experience of working in a team is seen as an important feature of the unit. Students often find it difficult to work effectively with others and will benefit from the opportunity provided by this unit to further develop this skill.

Minor selective

ISYS3401
Information Technology Evaluation

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160) **Assessment:** Through semester assessment (35%) and Final Exam (65%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Information Systems (IS) professionals in today's organisations are required to play leadership roles in change and development. Your success in this field will be aided by your being able to carry out research-based investigations using suitable methods and mastery over data collection and analysis to assist in managing projects and in decision making. Practical research skills are some of the most important assets you will need in your career.

This unit of study will cover important concepts and skills in practical research for solving and managing important problems. This will also provide you with the skills to undertake the capstone project in the IS project unit of study offered in Semester 2 or other projects. It will also provide hand-on experience of using Microsoft Excel and other tools to perform some of the quantitative analysis.

ISYS3402
Decision Analytics and Support Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** (ISYS2110 OR INFO2110) AND (ISYS2120 OR INFO2120) **Assumed knowledge:** Database Management AND Systems Analysis and Modelling **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

With the rapid increases in the volume and variety of data available, the problem of providing effective support to facilitate good decision making has become more challenging. This unit of study will provide a comprehensive understanding the diverse types of decision and the decision making processes. It will introduce decision modelling and the design and implementation of application systems to support decision making in organisational contexts. It will include a range of business intelligence and analytics solutions based on online analytical processing (OLAP) models and technologies. The unit will also cover a number of modelling approaches (optimization, predictive, descriptive) and their integration in the context of enabling improved, data-driven decision making.

Marine Science

Study in the discipline of Marine Science is offered as an interdisciplinary major. Units of study in this major are available at standard and advanced level.

About the major

The Marine Science major draws together relevant material to create a multi-disciplinary curriculum that provides you with in-depth knowledge in a range of marine science disciplines. The major is explicitly science-based but seeks to provide you with a broader range of capabilities and an interdisciplinary mind-set to service the large and growing demand for coastal and marine experts in a range of fields. You will take both biological and geological marine science units of study but with flexibility to choose your level of exposure within either of those broad disciplines.

Requirements for completion

A major in Marine Science requires 48 credit points, consisting of:

(i)12 credit points of 1000-level selective units
(ii)12 credit points of 2000-level core units
(iii)12 credit points of 3000-level core units
(iv)6 credit points of 3000-level skill units
(v)6 credit points of 3000-level specialisation units

A minor in Marine Science is available and articulates to this major.

First year

In first year you will be need to complete 12 credit points from a selection of bio- or geo-sciences units: BIOL1XX6, BIOL1XX7, GEOS1X01, GEOS1X03

As these units form the basis of your knowledge in second year, you are advised to complete at least one BIOL and one GEOS unit. If you can accommodate it in your schedule you could consider taking both units from your area of emphasis (GEOS or BIOL) as well as one unit from the other area.

Second year

Your second year units provide the knowledge base for your third year units. We have identified one unit from each of the discipline areas that are considered as fundamental and you must take each of these: GEOS2X15 and BIOL2X22

The geology unit introduces you to the physical processes shaping our oceans and coasts, presenting them within the context of climate change. The required biology unit will provide you with the basis in experimental design and analysis which is fundamental to scientific research in either discipline.

Third year

In your third year you are required to take one unit from each of the discipline areas, GEOS3X09 and BIOL3X13 as well as 6 credit points from a selection of: GEOS3X14, BIOL3X08, BIOL3X16 and 6 credit points from a selection of: GEOS3X14, BIOL3X08, BIOL3X16, GEOS3X03, AVBS3009.

This structure ensures you are exposed to core concepts in marine science including coastal and environmental processes as well as marine biology. You also then have a wide variety of other relevant units from which to choose including field classes, GIS techniques, aquaculture and sedimentary geology.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework

The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Marine Science: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/science/biology/
E biosci.genericadmin@sydney.edu.au
T +61 2 9351 4262

Address:
The University of Sydney Marine Studies Institute
Room 308, Madsen Building F09
University of Sydney NSW 2006

School of Life and Environmental Sciences
Level 5, Carslaw Building F07
University of Sydney NSW 2006

Dr Maria Byrne
T +61 2 9351 5253
E maria.byrne@sydney.usyd.edu.au

Undergraduate advisor: Dr Will Figueira
E will.figueira@sydney.edu.au
T +61 2 9351 2039

Learning Outcomes

Students who graduate from Marine Science will be able to:

1. Demonstrate a coherent understanding of marine science by articulating the methods of marine science, and explaining why current marine science knowledge is both contestable and testable through further inquiry.
2. Demonstrate a coherent understanding of marine science by explaining the role and relevance of marine habitats in society.
3. Recognise that marine science knowledge has been acquired by curiosity and creativity, and demonstrate creativity in thinking and problem solving.
4. Recognise and appreciate the significant role of marine habitats and biodiversity in sustaining life on our planet.
5. Recognise the multidisciplinarity of marine science and the complex interlinkages between bio- and geosciences in understanding biophysical processes.
6. Exhibit depth and breadth of “core concepts” that shape and influence marine and coastal environments, including geological and biological physical processes.
7. Exhibit depth and breadth of marine knowledge by demonstrating that these ‘core concepts’ have interdisciplinary connections with other disciplines.
8. Gather, synthesise and critically evaluate information about marine and coastal phenomena from a range of sources.
9. Critically analyse observations of marine biological and geoscience phenomena by creating and developing models and/or proposing and testing hypotheses.
10. Design and conduct field, laboratory based, or virtual experiments.
11. Select and apply practical and/or theoretical techniques.
12. Collect, accurately record, interpret, analyse, and draw conclusions from data.
13. Use state-of-the-art technology such as big data, numerical modelling and geographic information systems to collect, analyse, and visualise data.
14. Effectively synthesise and communicate marine science results using a range of modes (including oral, written, and visual) for a variety of purposes and audiences.
15. Account for their own learning and marine science work by being independent and self-directed learners.
16. Work effectively, responsibly and safely in individual and peer or team contexts.
17. Demonstrate knowledge of the regulatory frameworks and ethical principles relevant to the marine science area, and apply these in practice.

Marine Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MARINE SCIENCE			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Marine Science major			
A major in Marine Science requires 48 credit points from this table including: (i) 12 credit points of 1000-level selective units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units (iv) 6 credit points of 3000-level skill units (v) 6 credit points of 3000-level specialisation units NOTE: BIOL3X08 and BIOL3X16 are offered in alternate years			
Marine Science minor			
A minor in Marine Science requires 36 credit points from this table including: (i) 12 credit points of 1000-level selective units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Selective			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
GEOS1003 **Introduction to Geology**	6	**N** GEOS1903 or GEOL1002 or GEOL1902 or GEOL1501	Semester 2 Summer Main
GEOS1901 **Earth, Environment and Society Advanced**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 *Note: Department permission required for enrolment*	Semester 1
GEOS1903 **Introduction to Geology (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1003 or GEOL1002 or GEOL1902 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
GEOS2115 **Oceans, Coasts and Climate Change**	6	**A** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **P** 24 credit points from Junior Units of Study **N** GEOS2915 or MARS2006	Intensive July Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
GEOS2915 **Oceans, Coasts and Climate Change (Adv)**	6	**A** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **P** Distinction average in 48 credit points from Junior units of study. **N** GEOS2115 or MARS2006	Semester 1
BIOL2022 **Biology Experimental Design and Analysis**	6	**A** BIOL1XXX or MBLG1XXX **P** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **N** BIOL2922 or BIOL3006 or BIOL3906	Semester 2
BIOL2922 **Biol Experimental Design and Analysis Adv**	6	**A** BIOL1XXX or MBLG1XXX **P** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **N** BIOL2022 or BIOL3006 or BIOL3906	Semester 2
3000-level units of study			
Major and minor core			
GEOS3009 **Coastal Environments and Processes**	6	**P** (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics or Mathematics or Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **N** GEOS3909 or MARS3003 or MARS3105	Semester 1
GEOS3909 **Coastal Environments and Processes (Adv)**	6	**P** Distinction average in (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics, Mathematics, Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **N** GEOS3009 or MARS3003 or MARS3105 *A distinction average in prior Geography or Geology units is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.*	Semester 1
BIOL3013 **Marine Biology**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3913	Semester 2
BIOL3913 **Marine Biology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3013	Semester 2
Skill units			
GEOS3014 **GIS in Coastal Management**	6	**P** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **N** GEOS3914 or MARS3104	Semester 2
GEOS3914 **GIS in Coastal Management (Advanced)**	6	**P** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **N** GEOS3014 or MARS3104 *Note: Department permission required for enrolment* *A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.*	Semester 2
BIOL3008 **Marine Field Ecology** *This unit of study is not available in 2018*	6	**P** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **N** BIOL3908 or BIOL2028 or BIOL2928 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive July
BIOL3908 **Marine Field Ecology (Advanced)** *This unit of study is not available in 2018*	6	**P** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **N** BIOL3008 or BIOL2028 or BIOL2928 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive July
BIOL3016 **Coral Reef Biology**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3916 or BIOL2020 or BIOL2920 or NTMP3001 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
BIOL3916 **Coral Reef Biology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3016 or BIOL2020 or BIOL2920 or NTMP3001 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
Specialisation units			
GEOS3014 **GIS in Coastal Management**	6	**P** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **N** GEOS3914 or MARS3104	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
GEOS3914 **GIS in Coastal Management (Advanced)**	6	**P** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **N** GEOS3014 or MARS3104 *Note: Department permission required for enrolment* *A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.*	Semester 2
BIOL3008 **Marine Field Ecology** *This unit of study is not available in 2018*	6	**P** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **N** BIOL3908 or BIOL2028 or BIOL2928 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive July
BIOL3908 **Marine Field Ecology (Advanced)** *This unit of study is not available in 2018*	6	**P** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **N** BIOL3008 or BIOL2028 or BIOL2928 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive July
BIOL3016 **Coral Reef Biology**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3916 or BIOL2020 or BIOL2920 or NTMP3001 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
BIOL3916 **Coral Reef Biology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3016 or BIOL2020 or BIOL2920 or NTMP3001 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
GEOS3103 **Environmental and Sedimentary Geology**	6	**A** (GEOS1003 or GEOS1903) **P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3803	Semester 2
GEOS3803 **Environmental and Sedimentary Geology(Adv)**	6	**A** (GEOS1003 or GEOS1903) **P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3103 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 2
AVBS3009 to be developed for offering in 2019.			

Marine Science

MARINE SCIENCE

Advanced coursework and projects will be available in 2020 for students who complete this major.

Marine Science major

A major in Marine Science requires 48 credit points from this table including:(i) 12 credit points of 1000-level selective units(ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units (iv) 6 credit points of 3000-level skill units(v) 6 credit points of 3000-level specialisation unitsNOTE: BIOL3X08 and BIOL3X16 are offered in alternate years

Marine Science minor

A minor in Marine Science requires 36 credit points from this table including:(i) 12 credit points of 1000-level selective units (ii) 12 credit points of 2000-level core units(iii) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Selective

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed**

knowledge: HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

GEOS1001
Earth, Environment and Society

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the gateway unit of study for Human Geography, Physical Geography, Environmental Studies and Geology. Its objective is to introduce the big questions relating to the origins and current state of the planet: climate change, environment, landscape formation, and the growth of the human population. During the semester you will be introduced to knowledge, theories and debates about how the world's physical and human systems operate. The first module investigates the evolution of the planet through geological time, with a focus on major Earth systems such as plate tectonics and mantle convection and their interaction with the atmosphere, hydrosphere, biosphere and human civilisations. The second module presents Earth as an evolving and dynamic planet, investigating global environmental change, addressing climate variability and human impacts on the natural environment and the rate at which these changes occur and how they have the potential to dramatically affect the way we live. Finally, the third module, focuses on human-induced challenges to Earth's future. This part of the unit critically analyses the relationships between people and their environments, with central consideration to debates on population change, resource use and the policy contexts of climate change mitigation and adaptation.

GEOS1003
Introduction to Geology

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2, Summer Main **Classes:** Two 1 hour lectures and one 3 hour practical per week **Prohibitions:** GEOS1903 or GEOL1002 or GEOL1902 or GEOL1501 **Assessment:** One 2 hour exam, quizzes, tests, practical reports, field report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit of study is to examine the chemical and physical processes involved in mineral formation, the interior of the Earth, surface features, sedimentary environments, volcanoes, and metamorphism. Lectures and laboratory sessions on mountain building processes and the formation of mineral deposits will lead to an understanding of the forces controlling the geology of our planet. Processes such as weathering, erosion and nature of sedimentary environments are related to the origin of the Australian landscape. In addition to laboratory classes there is a one-day excursion to the western Blue Mountains and Lithgow to examine geological objects in their setting.

Textbooks

The recommended text is is Christiansen, E. H., and Hamblin, W. K. (2015). Dynamic earth: An introduction to physical geology. Burlington, MA: Jones and Bartlett Learning.

GEOS1901

Earth, Environment and Society Advanced

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1001, but will be required to carry out more challenging practical assignments.

GEOS1903

Introduction to Geology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour practical per week, field classes. **Prohibitions:** GEOS1003 or GEOL1002 or GEOL1902 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** One 2 hour exam, tests, quizzes, practical reports, field report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit has the same objectives as GEOS1003 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their ATAR or UAI and/or their university performance at the time of enrolment. Students that elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. This unit may be taken as part of the BSc (Advanced).

Textbooks

The recommended text is Christiansen, E. H., and Hamblin, W. K. (2015). Dynamic earth: An introduction to physical geology. Burlington, MA: Jones and Bartlett Learning.

2000-level units of study

Core

GEOS2115

Oceans, Coasts and Climate Change

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Müller, A/Prof Jody Webster, A.Prof Ana Vila-Concejo **Session:** Intensive July, Semester 1 **Classes:** Twenty-five 1 hour lectures, three 1 hour workshops, eight 2 hour practical classes. **Prerequisites:** 24 credit points from Junior Units of Study **Prohibitions:** GEOS2915 or MARS2006 **Assumed knowledge:** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **Assessment:** Lab reports (60%), one 2-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces core concepts about how the formation of ocean basins and their influence on climate govern the development of coasts and continental margins. These concepts provide a framework for understanding the geographic variation of coasts, continental shelves and sediment accumulations in the deep ocean. Ocean-basin evolution is explained in terms of movements within the Earth's interior and how these movements determine the geometry of ocean basins, and their alpine counterparts, which interact with the global circulation of the ocean and atmosphere. This interaction plays a key role in marine sedimentation and controls the environmental conditions responsible for the development of coral reefs and other ecosystems. The Unit of Study systematically outlines how these factors have played out to produce, by gradual change, the coasts we see today, as well as the less familiar deposits hidden beneath the sea and coastal lands. The Unit thereby outlines how knowledge of responses to climate change in the past allow us to predict environmental responses to accelerated climate change occurring now and in the future due to the industrial greenhouse effect, but places these responses into perspective against the geological record. Overall therefore, the Unit aims to provide familiarity with fundamental phenomena central to the study of marine geoscience and environmental impacts, introduced through process-oriented explanations. The Unit of Study is structured around GIS-based practical sessions and problem-based project work, for which lectures provide the theoretical background.

Textbooks

On line reading material provided via Fisher Library

GEOS2915

Oceans, Coasts and Climate Change (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Muller **Session:** Semester 1 **Classes:** Twenty-five 1 hour lectures, three 1 hour workshops, eight 2 hour practical classes. **Prerequisites:** Distinction average in 48 credit points from Junior units of study. **Prohibitions:** GEOS2115 or MARS2006 **Assumed knowledge:** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **Assessment:** Lab reports (60%), one 2 hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as GEOS2115 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives.

Textbooks

Online reading materials are provided via Fisher Library.

BIOL2022

Biology Experimental Design and Analysis

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **Prohibitions:** BIOL2922 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides foundational skills essential for doing research in biology and for critically judging the research of others. We consider how biology is practiced as a quantitative, experimental and theoretical science. We focus on the underlying principles and practical skills you need to explore questions and test hypotheses, particularly where background variation (error) is inherently high. In so doing, the unit provides you with an understanding of how biological research is designed, analysed and interpreted using statistics. Lectures focus on sound experimental and statistical principles, using examples in ecology and other fields of biology to demonstrate concepts. In the practical sessions, you will design and perform, analyse (using appropriate statistical tools) and interpret your own experiments to answer research questions in topics relevant to your particular interest. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and M. J. Keough. 2002. Experimental Design and Data Analysis for Biologists. 1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2922

Biol Experimental Design and Analysis Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **Prohibitions:** BIOL2022 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2922 will be based on BIOL2022 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and Keough, 2002. Experimental Design and Data Analysis for Biologists.1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

3000-level units of study

Major and minor core

GEOS3009
Coastal Environments and Processes

Credit points: 6 **Teacher/Coordinator:** A/Prof Jody Webster, A/Prof Ana Vila-Concejo, Dr Tristan Salles **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week; weekend excursion. **Prerequisites:** (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics or Mathematics or Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **Prohibitions:** GEOS3909 or MARS3003 or MARS3105 **Assessment:** One 2 hour exam, research reports and an online quiz (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this course is to introduce students to a variety of Coastal Environments and the major processes which control the morphodynamic evolution of these systems. The course offers a unique opportunity of learning the full spectrum of marine sedimentary environments from siliciclastic, temperate, highly urbanised and impacted estuarine ecosytems to carbonate, tropical, pristine and undeveloped/protected coastal and continental margin environments. The course is divided in three sections: Section A covers the basic morphodynamics and processes impacting carbonate-dominated coastal and continental margin environments. The focus is on carbonate reefal and margin systems and their geologic and biologic responses to past, present and future environmental changes; Section B covers the basic morphodynamics of temperate and tropical coasts, including beach morphodynamics and basic knowledge on waves and currents; Section C consolidates all concepts learnt in the previous sections by applying them to numerical modelling.

There is a compulsory weekend fieldtrip to the NSW coast to study beach morphodynamics and fieldwork techniques. Depending on the year, there may be a voluntary fieldtrip to a coral reef environment, for example, The University of Sydney One Tree Island Research Station.

Textbooks

List of selected readings provided online.

GEOS3909
Coastal Environments and Processes (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Jody Webster **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week; weekend excursion **Prerequisites:** Distinction average in (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics, Mathematics, Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **Prohibitions:** GEOS3009 or MARS3003 or MARS3105 **Assessment:** One 2 hour exam, research reports and an online quiz (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A distinction average in prior Geography or Geology units is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3009 but will carry out more challenging projects, practicals, assignments and tutorials.

BIOL3013
Marine Biology

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 4-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3913 **Assessment:** Practical reports, data exercises and exams (100%). **Practical field work:** Combination of field, lab and computer based practical activities **Mode of delivery:** Normal (lecture/lab/tutorial) day

We will examine in detail processes that are important for the establishment and maintenance of marine communities. Lectures will expose students to the key ideas, researchers and methodologies within selected fields of marine biology. Laboratory sessions and field excursions will complement the lectures by providing students with hands-on experience with the organisms and the processes that affect them. Students will develop critical analysis and scientific writing skills while examining the current literature.

BIOL3913
Marine Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Semester 2 **Classes:** See BIOL3013. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3013 **Assessment:** Practical reports, data exercises and exams (100%). **Practical field work:** Combination of field, lab and computer-based practical activities **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of the BIOL3013 Marine Biology unit. The content and nature of these components may vary from year to year but generally involves an individual or group project, conducted with unit instructors, which takes the place of one of the practical-based assessments..

Skill units

GEOS3014
GIS in Coastal Management

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** 2x1 hour lectures and 1x3h practical/week **Prerequisites:** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **Prohibitions:** GEOS3914 or MARS3104 **Assessment:** One 2 hour exam, two project reports, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Coastal Management is about how scientific knowledge is used to support policy formulation and planning decisions in coastal environments. The course links coastal science to policy and practice in management of estuaries, beaches and the coastal ocean. The principles are exemplified through specific issues, such as coastal erosion, pollution, and impacts of climate-change. The issues are dealt with in terms of how things work in nature, and how the issues are handled through administrative mechanisms. These mechanisms involve planning strategies like Marine Protected Areas and setback limits on civil development in the coastal zone. The coastal environments and processes that are more relevant to coastal management including: rocky coasts; beaches, barriers and dunes; and coral reefs will also be introduced. At a practical level, the link between science and coastal management is given substance through development and use of 'decision-support models'. These models involve geocomputing methods that entail application of simulation models, remotely sensed information, and Geographic Information Systems (GIS). The course therefore includes both principles and experience in use of these methods to address coastal-management issues. (It thus also involves extensive use of computers.) Although the focus is on the coast, the principles and methods have broader relevance to environmental management in particular, and to problem-solving in general. That is, the course has vocational relevance in examining how science can be exploited to the benefit of society and nature conservation.

GEOS3914
GIS in Coastal Management (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** Two hours of lectures, one 3 hour practical per week comprising one 1 hour practical demonstration and one 2 hour practical **Prerequisites:** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **Prohibitions:** GEOS3014 or MARS3104 **Assessment:** One 2 hour exam, project work, two practical-based project reports, fortnightly progress quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3014 but will carry out more challenging projects, practicals, assignments and tutorials.

BIOL3008
Marine Field Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Ross Coleman **Session:** Intensive July **Classes:** Intensive 8-day field course held in the pre-semester break. **Prerequisites:** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3908 or BIOL2028 or BIOL2928 **Assessment:** Discussion groups, research project proposal, biodiversity survey report, data analysis and checking, research project report (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This field course provides a practical introduction to the experimental analysis of marine populations and assemblages. Students gain experience using a range of intertidal sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. No particular mathematical or statistical skills are required for this subject. Group experimental research projects in the field are the focus of the unit during the day, with lectures and discussion groups about the analysis of experimental data and current issues in experimental marine ecology occurring in the evening.

Textbooks

No textbook is prescribed but Coastal Marine Ecology of Temperate Australia. Eds. Underwood, A.J. & Chapman, M.G. 1995. University of New South Wales Press, provides useful background reading.

BIOL3908
Marine Field Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Ross Coleman. **Session:** Intensive July **Classes:** One 8-day field course held in the pre-semester break, plus four 1-hour tutorials during semester 2. **Prerequisites:** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3008 or BIOL2028 or BIOL2928 **Assessment:** Discussion groups, research project proposal, biodiversity report, data analysis and checking, research project report (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This unit has the same objectives as Marine Field Ecology BIOL3008, and is suitable for students wishing to pursue certain aspects of marine field ecology in a greater depth. Entry is restricted and selection is made from applicants on the basis of past performance. Students taking this unit of study will be expected to take part in a number of additional tutorials after the field course on advanced aspects of experimental design and analysis and will be expected to incorporate these advanced skills into their analyses and project reports. This unit may be taken as part of the BSc(Advanced).

Textbooks

As for BIOL 3008.

BIOL3016
Coral Reef Biology

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Intensive July **Classes:** Fieldwork 80 hours block mode (during July) **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3916 or BIOL2020 or BIOL2920 or NTMP3001 **Assessment:** Participation in field work, essay, project report and an exam (100%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

Coral Reef Biology is an intensive unit held at a research station on the Great Barrier Reef. The unit focuses on the dominant taxa in coral reef environments and the linkages between them. Emphasis is placed on the biological adaptations for life in tropical waters and the ecological, oceanographic and physiological processes involved. Aspects covered include: processes influencing the distribution of coral reefs, symbiosis, reef connectivity, lagoon systems, nutrient cycling and the impacts of climate change and other anthropogenic pressures on the world's corals reefs.

BIOL3916
Coral Reef Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Intensive July **Classes:** Fieldwork 80 hours block mode (during July) **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3016 or BIOL2020 or BIOL2920 or NTMP3001 **Assessment:** Participation in field work, essay, project report and exam (100%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

This unit has the same objectives as BIOL3016, Coral Reef Biology, and is suitable for students who wish to pursue certain aspects of tropical marine biology in greater depth, with a focus on the GBR. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study will pursue individual projects in consultation with, and under the guidance of, the course coordinator. The aim is to design a project relating to the particular interests of the student. The nature of these projects will vary from year to year. This unit of study may be taken as part of the BSc (Advanced) program.

Specialisation units

GEOS3014
GIS in Coastal Management

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** 2x1 hour lectures and 1x3h practical/week **Prerequisites:** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **Prohibitions:** GEOS3914 or MARS3104 **Assessment:** One 2 hour exam, two project reports, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Coastal Management is about how scientific knowledge is used to support policy formulation and planning decisions in coastal environments. The course links coastal science to policy and practice in management of estuaries, beaches and the coastal ocean. The principles are exemplified through specific issues, such as coastal erosion, pollution, and impacts of climate-change. The issues are dealt with in terms of how things work in nature, and how the issues are handled through administrative mechanisms. These mechanisms involve planning strategies like Marine Protected Areas and setback limits on civil development in the coastal zone. The coastal environments and processes that are more relevant to coastal management including: rocky coasts; beaches, barriers and dunes; and coral reefs will also be introduced. At a practical level, the link between science and coastal management is given substance through development and use of 'decision-support models'. These models involve geocomputing methods that entail application of simulation models, remotely sensed information, and Geographic Information Systems (GIS). The course therefore includes both principles and experience in use of these methods to address coastal-management issues. (It thus also involves extensive use of computers.) Although the focus is on the coast, the principles and methods have broader relevance to environmental management in particular, and to problem-solving in general. That is, the course has vocational relevance in examining how science can be exploited to the benefit of society and nature conservation.

GEOS3914
GIS in Coastal Management (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** Two hours of lectures, one 3 hour practical per week comprising one 1 hour practical demonstration and one 2 hour practical **Prerequisites:** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **Prohibitions:** GEOS3014 or MARS3104 **Assessment:** One 2 hour exam, project work, two practical-based project reports, fortnightly progress quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3014 but will carry out more challenging projects, practicals, assignments and tutorials.

BIOL3008
Marine Field Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Ross Coleman **Session:** Intensive July **Classes:** Intensive 8-day field course held in the pre-semester break. **Prerequisites:** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3908 or BIOL2028 or BIOL2928 **Assessment:** Discussion groups, research project proposal, biodiversity survey report, data analysis and checking, research project report (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This field course provides a practical introduction to the experimental analysis of marine populations and assemblages. Students gain experience using a range of intertidal sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. No particular mathematical or statistical skills are required for this subject. Group experimental research projects in the field are the focus of the unit during the day, with lectures and discussion groups about the analysis of experimental data and current issues in experimental marine ecology occurring in the evening.

Textbooks

No textbook is prescribed but Coastal Marine Ecology of Temperate Australia. Eds. Underwood, A.J. & Chapman, M.G. 1995. University of New South Wales Press, provides useful background reading.

BIOL3908
Marine Field Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Ross Coleman. **Session:** Intensive July **Classes:** One 8-day field course held in the pre-semester break, plus four 1-hour tutorials during semester 2. **Prerequisites:** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3008 or BIOL2028 or BIOL2928 **Assessment:** Discussion groups, research project proposal, biodiversity report, data analysis and checking, research project report (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This unit has the same objectives as Marine Field Ecology BIOL3008, and is suitable for students wishing to pursue certain aspects of marine field ecology in a greater depth. Entry is restricted and selection is made from applicants on the basis of past performance. Students taking this unit of study will be expected to take part in a number of additional tutorials after the field course on advanced aspects of experimental design and analysis and will be expected to incorporate these advanced skills into their analyses and project reports. This unit may be taken as part of the BSc(Advanced).

Textbooks

As for BIOL 3008.

BIOL3016
Coral Reef Biology

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Intensive July **Classes:** Fieldwork 80 hours block mode (during July) **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3916 or BIOL2020 or BIOL2920 or NTMP3001 **Assessment:** Participation in field work, essay, project report and an exam (100%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

Coral Reef Biology is an intensive unit held at a research station on the Great Barrier Reef. The unit focuses on the dominant taxa in coral reef environments and the linkages between them. Emphasis is placed on the biological adaptations for life in tropical waters and the ecological, oceanographic and physiological processes involved. Aspects covered include: processes influencing the distribution of coral reefs, symbiosis, reef connectivity, lagoon systems, nutrient cycling and the impacts of climate change and other anthropogenic pressures on the world's corals reefs.

BIOL3916
Coral Reef Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Intensive July **Classes:** Fieldwork 80 hours block mode (during July) **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3016 or BIOL2020 or BIOL2920 or NTMP3001 **Assessment:** Participation in field work, essay, project report and exam (100%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

This unit has the same objectives as BIOL3016, Coral Reef Biology, and is suitable for students who wish to pursue certain aspects of tropical marine biology in greater depth, with a focus on the GBR. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study will pursue individual projects in consultation with, and under the guidance of, the course coordinator. The aim is to design a project relating to the particular interests of the student. The nature of these projects will vary from year to year. This unit of study may be taken as part of the BSc (Advanced) program.

GEOS3103
Environmental and Sedimentary Geology

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3803 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical reports and quizes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Sediments and sedimentary rocks cover most of the Earth's surface, record much of the Earth's geological and climatic history and host important resources such as petroleum, coal, water and mineral ores. The aim of this unit is to provide students with the skills required to examine, describe and interpret sediments and sedimentary rocks for a variety of different purposes. Specific foci of the unit will be the identification of the recent or ancient environment in which sedimentary materials were deposited, the environmental controls which produce sedimentary structures, and the processes that control the production, movement and storage of sediment bodies. On completion of this unit students will be familiar with the natural processes that produce and modify sediments across a range of environments at the Earth's surface, including fluvial, aeolian, lacustrine, marginal marine and deep marine environments. The various controls on the sedimentary record such as climate and sea-level change, as well as diagenesis and geochemical cycles will also be discussed. Practical exercises will require students to examine global datasets, and determine the properties and significance of sediments and sedimentary rocks. The course is relevant to students interested in petroleum or mineral exploration, environmental and engineering geology as well as marine geoscience.

Textbooks

Course notes will be available from the Copy Centre and an appropriate set of reference texts will be placed on special reserve in the library.

GEOS3803
Environmental and Sedimentary Geology(Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3103 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical, field reports and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3103 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Textbooks

Course notes will be available from the Copy Centre and appropriate set of reference texts will be placed on special reserve in the library.

AVBS3009 to be developed for offering in 2019.

Mathematical Sciences

The School of Mathematics and Statistics is situated in the Faculty of Science. Units of study in this program are available at standard and advanced level.

About the program

Mathematics and Statistics is an extremely diverse discipline (or even set of disciplines) that has common ideas and themes that develop and become clear to high achieving students as they progress in their studies. Generally speaking, a deep understanding of the common ideas and their application in both theoretical and practical spheres comes as a result of high-level syntheses rather than low-level foundational learning.

We want to give our very best students the opportunity to attain this level of learning through a program which enables them to engage across the breadth of the subject and to develop depth in one or more subdisciplines. This program will form an outstanding foundation for honours at 4000-level in Pure Mathematics, Applied Mathematics or Statistics.

Requirements for completion

A program in Mathematical Sciences requires 60 credit points, consisting of:

(i)A 48 credit point major in either Financial Mathematics and Statistics, Mathematics or Statistics, and:

- For students with a major in Mathematics, 6 credit points of 2000-level selective units and 6 credit points of 3000-level selective mathematics or statistics units in addition to those counted towards the major.
- For students with a major in Financial Mathematics and Statistics or Statistics, 12 credit points of 2000-level selective mathematics or statistics units in addition to those counted towards the major.

First year

MATH1021/1921/1931, MATH1023/1923/1933 and MATH1002/1902, and 3 credit points from a selection of: MATH1004/1904 or MATH1005/1905. If you are taking a Science degree you must take either MATH1005/1905 or the combination DATA1001 and MATH1004/1904.

The first year units provide a strong foundation for further learning and a broad introduction to the Mathematical Sciences and will equip you for all of the majors, Mathematics, Financial Mathematics and Statistics, and Statistics, that are offered in this program. MATH1021/1921/1931 and MATH1023/1923/1933 extend your knowledge of calculus and introduce you to calculus of several variables and mathematical modelling with differential equations. MATH1002/1902 introduces you to linear algebra, including matrices and their applications. MATH1005/1905 introduces you to working with data and MATH1004/1904 is a unit on discrete mathematics, which is the mathematics of counting and arrangement.

All first year MATH units are 3 credit point units.

Second year

Based on major choice, students complete 6 or 12 credit points, in addition to those counted towards the major, from a selection of: MATH20212921, MATH20222922, MATH20232923, MATH2068/2988, MATH2069/2969, MATH2070/2970, STAT2011/2911, STAT2912, DATA2002. For further information about each major, please look at the handbook page for that major.

The program aims to give you a broad foundational knowledge at 2000 level that will equip you for study of one or more majors in third year.

Third year

Students completing a Mathematics major complete 6 credit points from a wide selection of mathematics or statistics units in addition to those counted towards the major. Students completing a Statistics major, or a Financial Mathematics and Statistics major will take all four 3000-level units listed in their major.

For further information about each major, please look at the Table A handbook page for that major.

In your third year you must take at least one designated project unit as well as a range of other specialist units for the major that you have chosen.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Students who complete a major in Statistics are able to go on to honours in Statistics. Students who complete a major in Mathematics are able to go on to honours in Applied Mathematics or Pure Mathematics. Students who complete a major in Financial Mathematics and Statistics are able to go on to honours in Applied Mathematics or Statistics. Students must satisfy honours admission requirements.

Requirements for Honours for all areas of Mathematical Sciences: completion of 24 credit points of project work and 24 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W www.maths.usyd.edu.au/

First year enquiries email: firstyear@maths.usyd.edu.au
Other undergraduate enquiries email: ug-enq@maths.usyd.edu.au
All enquiries phone: +61 2 9351 5804 or +61 2 9351 5787

School of Mathematics and Statistics
Level 5, Carslaw Building F07
University of Sydney NSW 2006

Professor Mary Myerscough
T +61 2 9351 3724
E mary.myerscough@sydney.edu.au

Learning Outcomes

Students who graduate from Mathematical Sciences will be able to show:

1. Ability to construct logical, clearly presented and justified arguments incorporating deductive reasoning
2. Knowledge of the principles and concepts of a broad range of fundamental areas in mathematics and statistics
3. Ability to formulate and model practical and abstract problems in mathematical or statistical terms using a variety of methods
4. Ability to apply mathematical principles, concepts, techniques and technology to solve practical and abstract problems and interpret results critically
5. Understanding of the breadth of the discipline, its role in other fields and the way that other fields contribute to development in Mathematical Sciences
6. Appropriate interpretation of information communicated in statistical or mathematical form
7. Appropriate presentation of information, reason and conclusions in a variety of modes to diverse audiences (expert and non-expert).

Mathematical Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MATHEMATICAL SCIENCES			
Mathematical Sciences program			
The Mathematical Sciences program is available only to students enrolled in the Dalyell stream.			
A program in Mathematical Sciences requires 60 credit points including: (i) A 48 credit point major in either Financial Mathematics and Statistics, Mathematics or Statistics, and: (a) For students with a major in Mathematics, 6 credit points of 2000-level selective units and 6 credit points of 3000-level selective mathematics or statistics units in addition to those counted towards the major. (b) For students with a major in Financial Mathematics and Statistics or Statistics, 12 credit points of 2000-level selective mathematics or statistics units in addition to those counted towards the major.			
Units of study			
The units of study are listed below.			
2000-level units of study			
Selective			
MATH2021 **Vector Calculus and Differential Equations**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1XX2) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) **N** MATH2921 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067	Semester 1
MATH2921 **Vector Calculus and Differential Eqs (Adv)**	6	**P** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **N** MATH2021 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067	Semester 1
MATH2022 **Linear and Abstract Algebra**	6	**P** MATH1XX2 **N** MATH2922 or MATH2968 or MATH2061 or MATH2961	Semester 1
MATH2922 **Linear and Abstract Algebra (Advanced)**	6	**P** MATH1902 or (a mark of 65 or above in MATH1002) **N** MATH2022 or MATH2968 or MATH2061 or MATH2961	Semester 1
MATH2023 **Analysis**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1XX2) **N** MATH2923 or MATH3068 or MATH2962	Semester 2
MATH2923 **Analysis (Advanced)**	6	**P** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **N** MATH2023 or MATH2962 or MATH3068	Semester 2
MATH2068 **Number Theory and Cryptography**	6	**A** MATH1014 or MATH1002 or MATH1902 **P** 6 credit points of Junior Mathematics units **N** MATH2988 or MATH3009 or MATH3024	Semester 2
MATH2988 **Number Theory and Cryptography Advanced**	6	**P** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH19X3 or MATH1907 or (a mark of 65 or above in MATH1023 or MATH1003)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **N** MATH2068	Semester 2
MATH2069 **Discrete Mathematics and Graph Theory**	6	**P** 6 credit points of Junior Mathematics units **N** MATH2011 or MATH2009 or MATH2969	Semester 1
MATH2969 **Discrete Mathematics and Graph Theory Adv**	6	**P** 9 credit points of Junior Mathematics (advanced level or Credit at the normal level) **N** MATH2011 or MATH2009 or MATH2069	Semester 1
MATH2070 **Optimisation and Financial Mathematics**	6	**A** MATH1X23 or MATH1933 or MATH1X03 or MATH1907 **P** (MATH1X21 or MATH1011 or MATH1931 or MATH1X01 or MATH1906) and (MATH1014 or MATH1X02) **N** MATH2010 or MATH2033 or MATH2933 or MATH2970 or ECMT3510 *Students may enrol in both MATH2070 and MATH3075 in the same semester*	Semester 2
MATH2970 **Optimisation and Financial Mathematics Adv**	6	**A** MATH19X3 or MATH1907 or a mark of 65 or above in MATH1003 or MATH1023 **P** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **N** MATH2010 or MATH2033 or MATH2933 or MATH2070 or ECMT3510 *Students may enrol in both MATH2970 and MATH3975 in the same semester*	Semester 2
STAT2011 **Probability and Estimation Theory**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **N** STAT2901 or STAT2001 or STAT2911	Semester 1
STAT2911 **Probability and Statistical Models (Adv)**	6	**P** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **N** STAT2001 or STAT2901 or STAT2011	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
STAT2912 **Statistical Tests (Advanced)**	6	**A** STAT2911 **P** MATH1905 or Credit in MATH1005 or Credit in ECMT1010 or Credit in BUSS1020 **N** STAT2012 or STAT2004 or DATA2002	Semester 2
DATA2002 **Data Analytics: Learning from Data**	6	**A** (Basic Linear Algebra and some coding) or QBUS1040 **P** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **N** STAT2012 or STAT2912	Semester 2
## 3000-level units of study			
Selective			
MATH3061 **Geometry and Topology**	6	**P** 12 credit points of Intermediate Mathematics **N** MATH3001 or MATH3006	Semester 2
MATH3063 **Nonlinear ODEs with Applications**	6	**A** MATH2061 or [MATH2X21 and MATH2X22] **P** 12 credit points of Intermediate mathematics **N** MATH3003 or MATH3923 or MATH3020 or MATH3920 or MATH3963	Semester 1
MATH3066 **Algebra and Logic**	6	**P** 6 credit points of Intermediate Mathematics **N** MATH3062 or MATH3065	Semester 1
MATH3076 **Mathematical Computing**	6	**P** 12 credit points of MATH2XXX and 6 credit points from (MATH1021 or MATH1001 or MATH1023 or MATH1003 or MATH19X1 or MATH19X3 or MATH1906 or MATH1907) **N** MATH3976 or MATH3016 or MATH3916	Semester 1
MATH3078 **PDEs and Waves**	6	**A** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **P** 12 credit points of Intermediate Mathematics **N** MATH3018 or MATH3921 or MATH3978	Semester 2
MATH3961 **Metric Spaces (Advanced)**	6	**A** MATH2923 or MATH2962 **P** Credit average or greater in 12 credit points of Intermediate Mathematics units **N** MATH3001 or MATH3901	Semester 1
MATH3962 **Rings, Fields and Galois Theory (Adv)**	6	**A** MATH2922 or MATH2961 **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3062 or MATH3902 or MATH3002 *Students are advised to take MATH2968 before attempting this unit.*	Semester 1
MATH3963 **Nonlinear ODEs with Applications (Adv)**	6	**A** (MATH2961 or [MATH2921 and MATH2922]) and (MATH2962 or MATH2923) **P** 12 credit points of Intermediate mathematics **N** MATH3003 or MATH3923 or MATH3020 or MATH3920 or MATH3063	Semester 1
MATH3968 **Differential Geometry (Advanced)**	6	**A** At least 6 credit points of Intermediate Advanced Mathematics or Senior Advanced Mathematics units **P** A mark of 65 or above in MATH2961 or MATH2921 **N** MATH3903	Semester 2
MATH3969 **Measure Theory and Fourier Analysis (Adv)**	6	**A** At least 6 credit points of (Intermediate Advanced Mathematics or Senior Advanced Mathematics units) **P** Credit average or greater in 12 credit points Intermediate Mathematics **N** MATH3909	Semester 2
MATH3974 **Fluid Dynamics (Advanced)**	6	**A** [MATH2961 and MATH2965] or [MATH2921 and MATH2922] **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3914	Semester 1
MATH3976 **Mathematical Computing (Advanced)**	6	**P** 12 credit points of MATH2XXX and [6 credit points from (MATH1923 or MATH1903 or MATH1933 or MATH1907), or a mark of 65 or above in (MATH1023 or MATH1003)] **N** MATH3076 or MATH3016 or MATH3916	Semester 1
MATH3977 **Lagrangian and Hamiltonian Dynamics (Adv)**	6	**P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH2904 or MATH2004 or MATH3917	Semester 2
MATH3978 **PDEs and Waves (Advanced)**	6	**A** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3078 or MATH3018 or MATH3921	Semester 2
MATH3X20, MATH3X10, MATH3X70, MATH3979, MATH3X11, MATH3X21, MATH3X22, MATH3X23, MATH3X24, MATH3X25, MATH3X26, MATH3X27, MATH3X28, MATH3X29, MATH3X12, MATH3X13, MATH3X14, MATH3X15, MATH3X16, MATH3X17, MATH3X18, MATH3X19, STAT3021, STAT3X22, STAT3X23, STAT3024 to be developed for offering in 2019.			

Mathematics

MATHEMATICAL SCIENCES

Mathematical Sciences program

The Mathematical Sciences program is available only to students enrolled in the Dalyell stream.A program in Mathematical Sciences requires 60 credit points including:(i) A 48 credit point major in either Financial Mathematics and Statistics, Mathematics or Statistics, and: (a) For students with a major in Mathematics, 6 credit points of 2000-level selective units and 6 credit points of 3000-level selective mathematics or statistics units in addition to those counted towards the major.(b) For students with a major in Financial Mathematics and Statistics or Statistics, 12 credit points of 2000-level selective mathematics or statistics units in addition to those counted towards the major.

Units of study

The units of study are listed below.

2000-level units of study

Selective

MATH2021
Vector Calculus and Differential Equations

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1XX2) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) **Prohibitions:** MATH2921 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067 **Assessment:** assessment for this unit consists of quizzes, assignments, and a final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit opens with topics from vector calculus, including vector-valued functions (parametrised curves and surfaces; vector fields; div, grad and curl; gradient fields and potential functions), line integrals (arc length; work; path-independent integrals and conservative fields; flux across a curve), iterated integrals (double and triple integrals, polar, cylindrical and spherical coordinates; areas, volumes and mass; Green's Theorem), flux integrals (flow through a surface; flux integrals through a surface defined by a function of two variables, through cylinders, spheres and other parametrised surfaces), Gauss' and Stokes' theorems.The unit then moves to topics in solution techniques for ordinary and partial differential equations (ODEs and PDEs) with applications. It provides a basic grounding in these techniques to enable students to build on the concepts in their subsequent courses. The main topics are: second order ODEs (including inhomogeneous equations), higher order ODEs and systems of first order equations, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series).

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2921
Vector Calculus and Differential Eqs (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **Prohibitions:** MATH2021 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067 **Assessment:** assessment for this unit consists of quizzes, assignments, and a final exam. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the advanced version of MATH2021, with more emphasis on the underlying concepts and mathematical rigour.The vector calculus component of the course will include: parametrised curves and surfaces, vector fields, div, grad and curl, gradient fields and potential functions, lagrange multipliers line integrals, arc length, work, path-independent integrals, and conservative fields, flux across a curve, double and triple integrals, change of variable formulas, polar, cylindrical and spherical coordinates, areas, volumes and mass, flux integrals, and Green's Gauss' and Stokes' theorems.The Differential Equations half of the course will focus on ordinary and partial differential equations (ODEs and PDEs) with applications with more complexity and depth. The main topics are: second order ODEs (including inhomogeneous equations), series solutions near a regular point, higher order ODEs and systems of first order equations, matrix equations and solutions, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, elementary Sturm-Liouville theory, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series). The unit then moves to topics in solution techniques for ordinary and partial differential equations (ODEs and PDEs) with applications. It provides a more thorough grounding in these techniques to enable students to build on the concepts in their subsequent courses. The main topics are: second order ODEs (including inhomogeneous equations), higher order ODEs and systems of first order equations, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series).

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2022
Linear and Abstract Algebra

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** MATH1XX2 **Prohibitions:** MATH2922 or MATH2968 or MATH2061 or MATH2961 **Assessment:** quizzes, assignments and final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Linear and abstract algebra is one of the cornerstones of mathematics and it is at the heart of many applications of mathematics and statistics in the sciences and engineering. This unit investigates and explores properties of linear functions, developing general principles relating to the solution sets of homogeneous and inhomogeneous linear equations, including differential equations. Linear independence is introduced as a way of understanding and solving linear systems of arbitrary dimension. Linear operators on real spaces are investigated, paying particular attention to the geometrical significance of eigenvalues and eigenvectors, extending ideas from first year linear algebra. To better understand symmetry, matrix and permutation groups are introduced and used to motivate the study of abstract group theory.

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2922
Linear and Abstract Algebra (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** MATH1902 or (a mark of 65 or above in MATH1002) **Prohibitions:** MATH2022 or MATH2968 or MATH2061 or MATH2961 **Assessment:** quizzes, assignments and final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Linear and abstract algebra is one of the cornerstones of mathematics and it is at the heart of many applications of mathematics and statistics in the sciences and engineering. This unit is an advanced version of MATH2022, with more emphasis on the underlying concepts and on mathematical rigour. This unit investigates and explores properties of vector spaces, matrices and linear transformations, developing general principles relating to the solution sets of homogeneous and inhomogeneous linear equations, including differential equations. Linear independence is introduced as a way of understanding and solving linear systems of arbitrary dimension. Linear operators on real spaces are investigated, paying particular attention to the geometrical significance of eigenvalues and eigenvectors, extending ideas from first year linear algebra. To better understand symmetry, matrix and permutation groups are introduced and used to motivate the study of abstract group theory. The unit culminates in studying inner spaces, quadratic forms and normal forms of matrices together with their applications to problems both in mathematics and in the sciences and engineering.

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2023
Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** lecture 3hrs/week; practice class 1hr/week; tutorial 1hr/week **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1XX2) **Prohibitions:** MATH2923 or MATH3068 or MATH2962 **Assessment:** assessment for this unit consists of quizzes, an assignment, and a final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Analysis grew out of calculus, which leads to the study of limits of functions, sequences and series. It is one of the fundamental topics underlying much of mathematics including differential equations, dynamical systems, differential geometry, topology and Fourier analysis. This unit introduces the field of mathematical analysis both with a careful theoretical framework as well as selected applications. It shows the utility of abstract concepts and teaches an understanding and construction of proofs in mathematics. This unit will be useful to students of mathematics, science and engineering and in particular to future school mathematics teachers, because we shall explain why common practices in the use of calculus are correct, and understanding this is important for correct applications and explanations. The unit starts with the foundations of calculus and the real numbers system. It goes on to study the limiting behaviour of sequences and series of real and complex numbers. This leads naturally to the study of functions defined as limits and to the notion of uniform convergence. Returning to the beginnings of calculus and power series expansions leads to complex variable theory: elementary functions of complex variable, the Cauchy integral theorem, Cauchy integral formula, residues and related topics with applications to real integrals.

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2923
Analysis (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** lecture 3hrs/week; practice class 1hr/week; tutorial 1hr/week **Prerequisites:** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **Prohibitions:** MATH2023 or MATH2962 or MATH3068 **Assessment:** assessment for this unit consists of quizzes, an assignment, and a final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Analysis grew out of calculus, which leads to the study of limits of functions, sequences and series. It is one of the fundamental topics underlying much of mathematics including differential equations, dynamical systems, differential geometry, topology and Fourier analysis. This advanced unit introduces the field of mathematical analysis both with a careful theoretical frame- work as well as selected applications. It shows the utility of abstract concepts and teaches an understanding and construction of proofs in mathematics. This unit will be useful to students with more mathematical maturity who study mathematics, science, or engineering. The unit starts with the foundations of calculus and the real numbers system, with more emphasis on the topology. It goes on to study the limiting behaviour of sequences and series of real and complex numbers. This leads naturally to the study of functions defined as limits and to the notion of uniform con- vergence. Returning to the beginnings of calculus and power series expansions leads to complex variable theory: elementary functions of complex variable, the Cauchy integral theorem, Cauchy integral formula, residues and related topics with applications to real integrals.

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2068
Number Theory and Cryptography

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** 6 credit points of Junior Mathematics units **Prohibitions:** MATH2988 or MATH3009 or MATH3024 **Assumed knowledge:** MATH1014 or MATH1002 or MATH1902 **Assessment:** 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cryptography is the branch of mathematics that provides the techniques for confidential exchange of information sent via possibly insecure channels. This unit introduces the tools from elementary number theory that are needed to understand the mathematics underlying the most commonly used modern public key cryptosystems. Topics include the Euclidean Algorithm, Fermat's Little Theorem, the Chinese Remainder Theorem, Möbius Inversion, the RSA Cryptosystem, the Elgamal Cryptosystem and the Diffie-Hellman Protocol. Issues of computational complexity are also discussed.

MATH2988
Number Theory and Cryptography Advanced

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH19X3 or MATH1907 or (a mark of 65 or above in MATH1023 or MATH1003)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **Prohibitions:** MATH2068 **Assessment:** One 2 hr exam, homework assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is an advanced version of MATH2068, sharing the same lectures but with more advanced topics introduced in the tutorials and computer laboratory sessions.

MATH2069
Discrete Mathematics and Graph Theory

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour practice class per week. **Prerequisites:** 6 credit points of Junior Mathematics units **Prohibitions:** MATH2011 or MATH2009 or MATH2969 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces students to several related areas of discrete mathematics, which serve their interests for further study in pure and applied mathematics, computer science and engineering. Topics to be covered in the first part of the unit include recursion and induction, generating functions and recurrences, combinatorics. Topics covered in the second part of the unit include Eulerian and Hamiltonian graphs, the theory of trees (used in the study of data structures), planar graphs, the study of chromatic polynomials (important in scheduling problems).

MATH2969
Discrete Mathematics and Graph Theory Adv

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour practice class per week. **Prerequisites:** 9 credit points of Junior Mathematics (advanced level or Credit at the normal level) **Prohibitions:** MATH2011 or MATH2009 or MATH2069 **Assessment:** One 2-hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will cover the same material as MATH2069 with some extensions and additional topics.

MATH2070
Optimisation and Financial Mathematics

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** (MATH1X21 or MATH1011 or MATH1931 or MATH1X01 or MATH1906) and (MATH1014 or MATH1X02) **Prohibitions:** MATH2010 or MATH2033 or MATH2933 or MATH2970 or ECMT3510 **Assumed knowledge:** MATH1X23 or MATH1933 or MATH1X03 or MATH1907 **Assessment:** One 2 hour exam, assignments, quiz, project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students may enrol in both MATH2070 and MATH3075 in the same semester

Problems in industry and commerce often involve maximising profits or minimising costs subject to constraints arising from resource limitations. The first part of this unit looks at programming problems and their solution using the simplex algorithm; nonlinear optimisation and the Kuhn Tucker conditions.

The second part of the unit deals with utility theory and modern portfolio theory. Topics covered include: pricing under the principles of expected return and expected utility; mean-variance Markowitz portfolio theory, the Capital Asset Pricing Model, log-optimal portfolios and the Kelly criterion; dynamical programming. Some understanding of probability theory including distributions and expectations is required in this part.

Theory developed in lectures will be complemented by computer laboratory sessions using MATLAB. Minimal computing experience will be required.

MATH2970
Optimisation and Financial Mathematics Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week (lectures given in common with MATH2070). **Prerequisites:** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **Prohibitions:** MATH2010 or MATH2033 or MATH2933 or MATH2070 or ECMT3510 **Assumed knowledge:** MATH19X3 or MATH1907 or a mark of 65 or above in MATH1003 or MATH1023 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students may enrol in both MATH2970 and MATH3975 in the same semester

The content of this unit of study parallels that of MATH2070, but students enrolled at Advanced level will undertake more advanced problem solving and assessment tasks, and some additional topics may be included.

STAT2011
Probability and Estimation Theory

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory week. **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **Prohibitions:** STAT2901 or STAT2001 or STAT2911 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to univariate techniques in data analysis and the most common statistical distributions that are used to model patterns of variability. Common discrete random models like the binomial, Poisson and geometric, continuous models including the normal and exponential will be studied along with elementary regression models. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2911
Probability and Statistical Models (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **Prohibitions:** STAT2001 or STAT2901 or STAT2011 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an advanced version of STAT2011, with an emphasis on the mathematical techniques used to manipulate random variables and probability models. Common distributions including the Poisson, normal, beta and gamma families as well as the bivariate normal are introduced. Moment generating functions and convolution methods are used to understand the behaviour of sums of random variables. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The notions of conditional expectation and prediction will be covered as will be distributions related to the normal: chi^2, t and F. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2912
Statistical Tests (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** MATH1905 or Credit in MATH1005 or Credit in ECMT1010 or Credit in BUSS1020 **Prohibitions:** STAT2012 or STAT2004 or DATA2002 **Assumed knowledge:** STAT2911 **Assessment:** One 2-hour exam, assignments and/or quizzes, computer practical reports and one computer practical exam (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an advanced version of STAT2012 with an emphasis on both methods and the mathematical derivation of these methods: Tests of hypotheses and confidence intervals, including t-tests, analysis of variance, regression - least squares and robust methods, power of tests, non-parametric methods, non-parametric smoothing, tests for count data, goodness of fit, contingency tables. Graphical methods and diagnostic methods are used throughout with all analyses discussed in the context of computation with real data using an interactive statistical package.

DATA2002
Data Analytics: Learning from Data

Credit points: 6 **Teacher/Coordinator:** Jean Yang **Session:** Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prerequisites:** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **Prohibitions:** STAT2012 or STAT2912 **Assumed knowledge:** (Basic Linear Algebra and some coding) or QBUS1040 **Assessment:** written assignment, presentation, exams **Mode of delivery:** Normal (lecture/lab/tutorial) day

Technological advances in science, business, engineering has given rise to a proliferation of data from all aspects of our life. Understanding the information presented in these data is critical as it enables informed decision making into many areas including market intelligence and science. DATA2002 is an intermediate course in statistics and data sciences, focusing on learning data analytic skills for a wide range of problems and data. How should the Australian government measure and report employment and unemployment? Can we tell the difference between decaffeinated and regular coffee ? In this course, you will learn how to ingest, combine and summarise data from a variety of data models which are typically encountered in data science projects as well as reinforcing their programming skills through experience with statistical programming language. You will also be exposed to the concept of statistical machine learning and develop the skill to analyze various types of data in order to answer a scientific question. From this unit, you will develop knowledge and skills that will enable you to embrace data analytic challenges stemming from everyday problems.

3000-level units of study

Selective

MATH3061
Geometry and Topology

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3001 or MATH3006 **Assessment:** One 2 hour exam, tutorial tests, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of the unit is to expand visual/geometric ways of thinking. The geometry section is concerned mainly with transformations of the Euclidean plane (that is, bijections from the plane to itself), with a focus on the study of isometries (proving the classification theorem for transformations which preserve distances between points), symmetries (including the classification of frieze groups) and affine transformations (transformations which map lines to lines). The basic approach is via vectors and matrices, emphasising the interplay between geometry and linear algebra. The study of affine transformations is then extended to the study of collineations in the real projective plane, including collineations which map conics to conics. The topology section considers graphs, surfaces and knots from a combinatorial point of view. Key ideas such as homeomorphism, subdivision, cutting and pasting and the Euler invariant are introduced first for graphs (1-dimensional objects) and then for triangulated surfaces (2-dimensional objects). Topics include the classification of surfaces, map colouring, decomposition of knots and knot invariants.

MATH3063
Nonlinear ODEs with Applications

Credit points: 6 **Teacher/Coordinator:** Prof Leon Poladian **Session:** Semester 1 **Classes:** Three lectures, one tutorial per week **Prerequisites:** 12 credit points of Intermediate mathematics **Prohibitions:** MATH3003 or MATH3923 or MATH3020 or MATH3920 or MATH3963 **Assumed knowledge:** MATH2061 or [MATH2X21 and MATH2X22] **Assessment:** Class tests, Assignments, Final examination **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is an introduction to the theory of systems of ordinary differential equations. Such systems model many types of phenomena in engineering, biology and the physical sciences. The emphasis will not be on finding explicit solutions, but instead on the qualitative features of these systems, such as stability, instability and oscillatory behaviour. The aim is to develop a good geometrical intuition into the behaviour of solutions to such systems. Some background in linear algebra, and familiarity with concepts such as limits and continuity, will be assumed. The applications in this unit will be drawn from predator-prey systems, transmission of diseases, chemical reactions, beating of the heart and other equations and systems from mathematical biology.

MATH3066
Algebra and Logic

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 6 credit points of Intermediate Mathematics **Prohibitions:** MATH3062 or MATH3065 **Assessment:** One 2 hour exam (60%), two assignments (15% each), peer review of each assignment (5% each). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study unifies and extends mathematical ideas and techniques that most participants will have met in their first and second years, and will be of general interest to all students of pure and applied mathematics. It combines algebra and logic to present and answer a number of related questions of fundamental importance in the development of mathematics, from ancient to modern times. Classical and novel arithmetics are introduced, unified and described abstractly using field and ring axioms and the language of field extensions. Applications are presented, in particular the unsolvability of the celebrated classical construction problems of the Greeks. Quotient rings are introduced, culminating in a construction of the real numbers, by factoring out rings of Cauchy sequences of rationals by the ideal of null sequences. Axiomatics are placed in the context of reasoning within first order logic and set theory. The Propositional and Predicate Calculi are studied as model axiomatic systems in their own right, including sketches of proofs of consistency and completeness. The final part of the course introduces precise notions of computability and decidability, through abstract Turing machines, culminating in the unsolvability of the Halting Problem and the undecidability of First Order Logic.

MATH3076
Mathematical Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour laboratory per week. **Prerequisites:** 12 credit points of MATH2XXX and 6 credit points from (MATH1021 or MATH1001 or MATH1023 or MATH1003 or MATH19X1 or MATH19X3 or MATH1906 or MATH1907) **Prohibitions:** MATH3976 or MATH3016 or MATH3916 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to Fortran 95/2003 programming and numerical methods. Topics covered include computer arithmetic and computational errors, systems of linear equations, interpolation and approximation, solution of nonlinear equations, quadrature, initial value problems for ordinary differential equations and boundary value problems.

MATH3078
PDEs and Waves

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3018 or MATH3921 or MATH3978 **Assumed knowledge:** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **Assessment:** One 2 hour exam, assignments, quizzes (100%). To pass MATH3078/3978, students must achieve satisfactory performance in the in-semester assessment component. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces Sturm-Liouville eigenvalue problems and their role in finding solutions to boundary value problems. Analytical solutions of linear PDEs are found using separation of variables and integral transform methods. Three of the most important equations of mathematical physics - the wave equation, the diffusion (heat) equation and Laplace's equation - are treated, together with a range of applications. There is particular emphasis on wave phenomena, with an introduction to the theory of sound waves and water waves.

To pass MATH3078, students must achieve satisfactory performance in the in-semester assessment component in order to pass the unit of study.

MATH3961
Metric Spaces (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics units **Prohibitions:** MATH3001 or MATH3901 **Assumed knowledge:** MATH2923 or MATH2962 **Assessment:** 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Topology, developed at the end of the 19th Century to investigate the subtle interaction of analysis and geometry, is now one of the basic disciplines of mathematics. A working knowledge of the language and concepts of topology is essential in fields as diverse as algebraic number theory and non-linear analysis. This unit develops the basic ideas of topology using the example of metric spaces to illustrate and motivate the general theory. Topics covered include: Metric spaces, convergence, completeness and the contraction mapping theorem; Metric topology, open and closed subsets; Topological spaces, subspaces, product spaces; Continuous mappings and homeomorphisms; Compact spaces; Connected spaces; Hausdorff spaces and normal spaces, Applications include the implicit function theorem, chaotic dynamical systems and an introduction to Hilbert spaces and abstract Fourier series.

MATH3962
Rings, Fields and Galois Theory (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3062 or

MATH3902 or MATH3002 **Assumed knowledge:** MATH2922 or MATH2961 **Assessment:** One 2 hour exam, homework assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are advised to take MATH2968 before attempting this unit.

This unit of study investigates the modern mathematical theory that was originally developed for the purpose of studying polynomial equations. The philosophy is that it should be possible to factorize any polynomial into a product of linear factors by working over a "large enough" field (such as the field of all complex numbers). Viewed like this, the problem of solving polynomial equations leads naturally to the problem of understanding extensions of fields. This in turn leads into the area of mathematics known as Galois theory.

The basic theoretical tool needed for this program is the concept of a ring, which generalizes the concept of a field. The course begins with examples of rings, and associated concepts such as subrings, ring homomorphisms, ideals and quotient rings. These tools are then applied to study quotient rings of polynomial rings. The final part of the course deals with the basics of Galois theory, which gives a way of understanding field extensions.

MATH3963
Nonlinear ODEs with Applications (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Robert Marangell **Session:** Semester 1 **Classes:** Three lectures, one tutorial per week **Prerequisites:** 12 credit points of Intermediate mathematics **Prohibitions:** MATH3003 or MATH3923 or MATH3020 or MATH3920 or MATH3063 **Assumed knowledge:** (MATH2961 or [MATH2921 and MATH2922]) and (MATH2962 or MATH2923) **Assessment:** Class tests, Assignments, Final examination **Mode of delivery:** Normal (lecture/lab/tutorial) day

The theory of ordinary differential equations is a classical topic going back to Newton and Leibniz. It comprises a vast number of ideas and methods of different nature. The theory has many applications and stimulates new developments in almost all areas of mathematics. The emphasis is on qualitative analysis including phase-plane methods, bifurcation theory and the study of limit cycles. The more theoretical part includes existence and uniqueness theorems, linearisation, and analysis of asymptotic behaviour. The applications in this unit will be drawn from predator-prey systems, population models, chemical reactions, and other equations and systems from mathematical biology.

MATH3968
Differential Geometry (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** A mark of 65 or above in MATH2961 or MATH2921 **Prohibitions:** MATH3903 **Assumed knowledge:** At least 6 credit points of Intermediate Advanced Mathematics or Senior Advanced Mathematics units **Assessment:** One 2 hour exam and 2 assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an introduction to Differential Geometry, one of the core pillars of modern mathematics. Using ideas from calculus of several variables, we develop the mathematical theory of geometrical objects such as curves, surfaces and their higher-dimensional analogues. Differential geometry also plays an important part in both classical and modern theoretical physics. The course aims to develop geometrical ideas such as curvature in the context of curves and surfaces in space, leading to the famous Gauss-Bonnet formula relating the curvature and topology of a surface.

MATH3969
Measure Theory and Fourier Analysis (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorials per week. **Prerequisites:** Credit average or greater in 12 credit points Intermediate Mathematics **Prohibitions:** MATH3909 **Assumed knowledge:** At least 6 credit points of (Intermediate Advanced Mathematics or Senior Advanced Mathematics units) **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Measure theory is the study of such fundamental ideas as length, area, volume, arc length and surface area. It is the basis for the integration theory used in advanced mathematics since it was developed by Henri Lebesgue in about 1900. Moreover, it is the basis for modern probability theory. The course starts by setting up measure theory and integration, establishing important results such as Fubini's Theorem and the Dominated Convergence Theorem which allow us to manipulate integrals. This is then applied to Fourier Analysis, and results such as the Inversion Formula and Plancherel's Theorem are derived. The Radon-Nikodyn Theorem provides a representation of measures in terms of a density. Probability theory is then discussed with topics including distributions and conditional expectation.

MATH3974
Fluid Dynamics (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3914 **Assumed knowledge:** [MATH2961 and MATH2965] or [MATH2921 and MATH2922] **Assessment:** One 2 hour exam (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to fluid dynamics, starting with a description of the governing equations and the simplifications gained by using stream functions or potentials. It develops elementary theorems and tools, including Bernoulli's equation, the role of vorticity, the vorticity equation, Kelvin's circulation theorem, Helmholtz's theorem, and an introduction to the use of tensors. Topics covered include viscous flows, lubrication theory, boundary layers, potential theory, and complex variable methods for 2-D airfoils. The unit concludes with an introduction to hydrodynamic stability theory and the transition to turbulent flow.

MATH3976
Mathematical Computing (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of MATH2XXX and [6 credit points from (MATH1923 or MATH1903 or MATH1933 or MATH1907), or a mark of 65 or above in (MATH1023 or MATH1003)] **Prohibitions:** MATH3076 or MATH3016 or MATH3916 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

See entry for MATH3076 Mathematical Computing.

MATH3977
Lagrangian and Hamiltonian Dynamics (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH2904 or MATH2004 or MATH3917 **Assessment:** One 2 hour exam and assignments and/or quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides a comprehensive treatment of dynamical systems using the mathematically sophisticated framework of Lagrange and Hamilton. This formulation of classical mechanics generalizes elegantly to modern theories of relativity and quantum mechanics. The unit develops dynamical theory from the Principle of Least Action using the calculus of variations. Emphasis is placed on the relation between the symmetry and invariance properties of the Lagrangian and Hamiltonian functions and conservation laws. Coordinate and canonical transformations are introduced to make apparently complicated dynamical problems appear very simple. The unit will also explore connections between geometry and different physical theories beyond classical mechanics.

Students will be expected to solve fully dynamical systems of some complexity including planetary motion and to investigate stability using perturbation analysis. Hamilton-Jacobi theory will be used to elegantly solve problems ranging from geodesics (shortest path between two points) on curved surfaces to relativistic motion in the vicinity of black holes.

This unit is a useful preparation for units in dynamical systems and chaos, and complements units in differential equations, quantum theory and general relativity.

MATH3978
PDEs and Waves (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3078 or

MATH3018 or MATH3921 **Assumed knowledge:** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **Assessment:** One 2 hour exam, assignments, quizzes (100%). To pass MATH3078 or MATH3978, students must achieve satisfactory performance in the in-semester assessment component. **Mode of delivery:** Normal (lecture/lab/tutorial) day

As for MATH3078 PDEs and Waves but with more advanced problem solving and assessment tasks. Some additional topics may be included.

MATH3X20, MATH3X10, MATH3X70, MATH3979, MATH3X11, MATH3X21, MATH3X22, MATH3X23, MATH3X24, MATH3X25, MATH3X26, MATH3X27, MATH3X28, MATH3X29, MATH3X12, MATH3X13, MATH3X14, MATH3X15, MATH3X16, MATH3X17, MATH3X18, MATH3X19, STAT3021, STAT3X22, STAT3X23, STAT3024 to be developed for offering in 2019.

Mathematics

The School of Mathematics and Statistics is situated in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

Mathematics is powerful, beautiful and diverse. It is a language, a tool for analysis and prediction, and a way of thinking about the world. At 1000- and 2000-level, this major equips students with the foundational ideas of mathematics: abstract algebra, vector calculus and calculus of several variables, as well as formal proof and analysis.

At 3000-level and beyond, you will have a choice from a wide range of electives in both pure and applied areas of mathematics, including number theory, dynamical systems, geometry, topology and mathematical computing. The range of units available has been designed to cater for you - whether you intend to become a professional mathematician or to follow other interests with a highly sought-after set of mathematical skills.

All units in the mathematics major at 1000- and 2000-level are offered at Advanced level (with a 9 in the second place in the number in the unit code) as well as at standard level.

Requirements for completion

A major in Mathematics requires 48 credit points, consisting of:

(i)12 credit points of 1000-level units as follows: 6 credit points of calculus units; 3 credit points of linear algebra units; and 3 credit points of statistics or discrete mathematics units
(ii)12 credit points of 2000-level core units
(iii)6 credit points of 2000-level selective units
(iv)6 credit points of 3000-level interdisciplinary project units
(v)12 credit points of 3000-level selective units

A minor in Mathematics is available and articulates to this major.

First year

MATH1021/1921/1931, MATH1023/1923/1933 and MATH1002/1902, and 3 credit points from a selection of: MATH1004/1904 or MATH1005/1905. If you are taking a Science degree you must take either MATH1005/1905 or the combination DATA1001 and MATH1004/1904.

The first year units provide a strong foundation for further learning and a broad introduction to the Mathematical Sciences. MATH1021/1921/1931 and MATH1023/1923/1933 extend your knowledge of calculus and introduce you to calculus of several variables and mathematical modelling with differential equations. MATH1002/1902 introduces you to linear algebra, including matrices and their applications. MATH1005/1905 introduces you to working with data and MATH1004/1904 is a unit on discrete mathematics, which is the mathematics of counting and arrangement.

All first year MATH units are 3 credit point units.

Second year

MATH2021/2921 and MATH2022/2922 and 6 credit points from a selection of: MATH2023/2923 and MATH2068/2988.

Second year units in the Mathematics major give you core knowledge and skills which will be a solid and flexible foundation for a wide range of options in third year and beyond. MATH2021/2921 introduces you to vector calculus, a key theory in many areas of application and extends your knowledge of differential equations. MATH2022/2922 extends your understanding of linear algebra and introduces you to topics in abstract algebra such as group theory. MATH2023/2923 opens the world of Analysis to you. Analysis is the deep theoretical foundation of calculus, and sequences and series, for example. MATH2068/2988 introduces you to number theory and cryptography which underlies digital security systems. If you are unsure which selective to choose, MATH2023/2923 gives you the most options in third year. Alternatively, if you have space for an elective, you can choose to do both MATH2023/2923 and MATH2068/2088.

Third year

A 3000-level project unit and 12 credit points from a selection of MATH3XXX units.

In your third year you must take the designated project unit. This is only offered at standard level. For your other units you have a very wide choice which allows you to specialise in an area that interests you or to explore Mathematics more widely.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Students who complete a major in Mathematics may go on to honours in either Applied Mathematics or Pure Mathematics, depending on their interests and the units that they have chosen in their third year. Students must satisfy honours admission requirements. Both Applied Mathematics and Pure Mathematics honours require 24 credit points of coursework and 24 credit points of project work.

Honours units of study will be available in 2020.

Contact and further information

W www.maths.usyd.edu.au/

First year enquiries email: firstyear@maths.usyd.edu.au
Other undergraduate enquiries email: ug-enq@maths.usyd.edu.au
All enquiries phone: +61 2 9351 5804 or +61 2 9351 5787

School of Mathematics and Statistics
Level 5, Carslaw Building F07
University of Sydney NSW 2006

Professor Mary Myerscough
T +61 2 9351 3724
E mary.myerscough@sydney.edu.au

Learning Outcomes

Students who graduate from Mathematics will be able to show:

1. Ability to construct logical, clearly presented and justified arguments incorporating deductive reasoning
2. Knowledge of the principles and concepts of a broad range of fundamental areas in mathematics
3. Ability to formulate and model practical and abstract problems in mathematical terms using a variety of methods
4. Ability to apply mathematical principles, concepts, techniques and technology to solve practical and abstract problems and interpret results critically
5. Understanding of the breadth of the discipline, its role in other fields and the way that other fields contribute to development in Mathematics
6. Appropriate interpretation of information communicated in mathematical form
7. Appropriate presentation of information, reason and conclusions in a variety of modes to diverse audiences (expert and non-expert).

Mathematics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MATHEMATICS			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Mathematics major			
A major in Mathematics requires 48 credit points from this table including: (i) 12 credit points of 1000-level units as follows: 6 credit points of calculus units; 3 credit points of linear algebra units; and 3 credit points of statistics or discrete mathematics units (ii) 12 credit points of 2000-level core units (iii) 6 credit points of 2000-level selective units (iv) 6 credit points of 3000-level interdisciplinary project units (v) 12 credit points of 3000-level selective units			
Mathematics minor			
A minor in Mathematics requires 36 credit points from this table including: (i) 12 credit points of 1000-level units as follows: 6 credit points of calculus units; 3 credit points of linear algebra units; and 3 credit points of statistics or discrete mathematics units (ii) 12 credit points of 2000-level core units (iii) 6 credit points of 2000-level selective units (iv) 6 credit points of 3000-level selective or interdisciplinary project units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Calculus units			
MATH1021 **Calculus Of One Variable**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931	Semester 1
MATH1921 **Calculus Of One Variable (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 *Note: Department permission required for enrolment*	Semester 1
MATH1931 **Calculus Of One Variable (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 1
MATH1023 **Multivariable Calculus and Modelling**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933	Semester 2
MATH1923 **Multivariable Calculus and Modelling (Adv)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 *Note: Department permission required for enrolment*	Semester 2
MATH1933 **Multivariable Calculus and Modelling (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 2
Linear algebra units			
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1012 or MATH1014 or MATH1902	Semester 1 Summer Main
MATH1902 **Linear Algebra (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1002 or MATH1012 or MATH1014 *Note: Department permission required for enrolment*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Discrete mathematics units			
MATH1004 **Discrete Mathematics**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1904 or MATH1064 or MATH2011	Semester 2 Summer Main
MATH1904 **Discrete Mathematics (Advanced)**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1004 or MATH1064 or MATH2011 *Note: Department permission required for enrolment*	Semester 2
Statistics units			
MATH1005 **Statistical Thinking with Data**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020	Semester 2 Summer Main Winter Main
MATH1905 **Statistical Thinking with Data (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
MATH2021 **Vector Calculus and Differential Equations**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1XX2) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) **N** MATH2921 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067	Semester 1
MATH2921 **Vector Calculus and Differential Eqs (Adv)**	6	**P** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **N** MATH2021 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067	Semester 1
MATH2022 **Linear and Abstract Algebra**	6	**P** MATH1XX2 **N** MATH2922 or MATH2968 or MATH2061 or MATH2961	Semester 1
MATH2922 **Linear and Abstract Algebra (Advanced)**	6	**P** MATH1902 or (a mark of 65 or above in MATH1002) **N** MATH2022 or MATH2968 or MATH2061 or MATH2961	Semester 1
Selective			
MATH2023 **Analysis**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1XX2) **N** MATH2923 or MATH3068 or MATH2962	Semester 2
MATH2923 **Analysis (Advanced)**	6	**P** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **N** MATH2023 or MATH2962 or MATH3068	Semester 2
MATH2068 **Number Theory and Cryptography**	6	**A** MATH1014 or MATH1002 or MATH1902 **P** 6 credit points of Junior Mathematics units **N** MATH2988 or MATH3009 or MATH3024	Semester 2
MATH2988 **Number Theory and Cryptography Advanced**	6	**P** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH19X3 or MATH1907 or (a mark of 65 or above in MATH1023 or MATH1003)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **N** MATH2068	Semester 2
3000-level units of study			
Interdisciplinary project units			
MATH3X20 and MATH3X10 to be developed for offering in 2019.			
Selective			
MATH3061 **Geometry and Topology**	6	**P** 12 credit points of Intermediate Mathematics **N** MATH3001 or MATH3006	Semester 2
MATH3063 **Nonlinear ODEs with Applications**	6	**A** MATH2061 or [MATH2X21 and MATH2X22] **P** 12 credit points of Intermediate mathematics **N** MATH3003 or MATH3923 or MATH3020 or MATH3920 or MATH3963	Semester 1
MATH3066 **Algebra and Logic**	6	**P** 6 credit points of Intermediate Mathematics **N** MATH3062 or MATH3065	Semester 1
MATH3076 **Mathematical Computing**	6	**P** 12 credit points of MATH2XXX and 6 credit points from (MATH1021 or MATH1001 or MATH1023 or MATH1003 or MATH19X1 or MATH19X3 or MATH1906 or MATH1907) **N** MATH3976 or MATH3016 or MATH3916	Semester 1
MATH3078 **PDEs and Waves**	6	**A** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **P** 12 credit points of Intermediate Mathematics **N** MATH3018 or MATH3921 or MATH3978	Semester 2
MATH3961 **Metric Spaces (Advanced)**	6	**A** MATH2923 or MATH2962 **P** Credit average or greater in 12 credit points of Intermediate Mathematics units **N** MATH3001 or MATH3901	Semester 1
MATH3962 **Rings, Fields and Galois Theory (Adv)**	6	**A** MATH2922 or MATH2961 **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3062 or MATH3902 or MATH3002 *Students are advised to take MATH2968 before attempting this unit.*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MATH3969 **Measure Theory and Fourier Analysis (Adv)**	6	**A** At least 6 credit points of (Intermediate Advanced Mathematics or Senior Advanced Mathematics units) **P** Credit average or greater in 12 credit points Intermediate Mathematics **N** MATH3909	Semester 2
MATH3974 **Fluid Dynamics (Advanced)**	6	**A** [MATH2961 and MATH2965] or [MATH2921 and MATH2922] **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3914	Semester 1
MATH3976 **Mathematical Computing (Advanced)**	6	**P** 12 credit points of MATH2XXX and [6 credit points from (MATH1923 or MATH1903 or MATH1933 or MATH1907), or a mark of 65 or above in (MATH1023 or MATH1003)] **N** MATH3076 or MATH3016 or MATH3916	Semester 1
MATH3977 **Lagrangian and Hamiltonian Dynamics (Adv)**	6	**P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH2904 or MATH2004 or MATH3917	Semester 2
MATH3978 **PDEs and Waves (Advanced)**	6	**A** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3078 or MATH3018 or MATH3921	Semester 2
MATH3X70, MATH3979, MATH3X11, MATH3X21, MATH3X22, MATH3X23, MATH3X24, MATH3X25, MATH3X26, MATH3X27, MATH3X28, MATH3X29, MATH3X12, MATH3X13, MATH3X14, MATH3X15, MATH3X16, MATH3X17, MATH3X18, MATH3X19 to be developed for offering in 2019.			

Mathematics

MATHEMATICS

Advanced coursework and projects will be available in 2020 for students who complete this major.

Mathematics major

A major in Mathematics requires 48 credit points from this table including:(i) 12 credit points of 1000-level units as follows: 6 credit points of calculus units; 3 credit points of linear algebra units; and 3 credit points of statistics or discrete mathematics units(ii) 12 credit points of 2000-level core units(iii) 6 credit points of 2000-level selective units (iv) 6 credit points of 3000-level interdisciplinary project units (v) 12 credit points of 3000-level selective units

Mathematics minor

A minor in Mathematics requires 36 credit points from this table including:(i) 12 credit points of 1000-level units as follows: 6 credit points of calculus units; 3 credit points of linear algebra units; and 3 credit points of statistics or discrete mathematics units(ii) 12 credit points of 2000-level core units(iii) 6 credit points of 2000-level selective units(iv) 6 credit points of 3000-level selective or interdisciplinary project units

Units of study

The units of study are listed below.

1000-level units of study

Calculus units

MATH1021
Calculus Of One Variable

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals.

Textbooks
As set out in the Junior Mathematics Handbook.

MATH1921
Calculus Of One Variable (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals. Additional theoretical topics included in this advanced unit include the Intermediate Value Theorem, Rolle's Theorem, and the Mean Value Theorem.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1931
Calculus Of One Variable (SSP)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1921 Calculus of One Variable (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

MATH1023
Multivariable Calculus and Modelling

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1923
Multivariable Calculus and Modelling (Adv)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 **Assumed knowledge:** (HSC

Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable. Additional topics covered in this advanced unit of study include the use of diagonalisation of matrices to study systems of linear equation and optimisation problems, limits of functions of two or more variables, and the derivative of a function of two or more variables.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1933
Multivariable Calculus and Modelling (SSP)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1923 Multivariable Calculus and Modelling (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

Linear algebra units

MATH1002
Linear Algebra

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1014 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1002 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study introduces vectors and vector algebra, linear algebra including solutions of linear systems, matrices, determinants, eigenvalues and eigenvectors.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1902
Linear Algebra (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1002 or MATH1012 or MATH1014 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. It parallels the normal unit MATH1002 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

Discrete mathematics units

MATH1004
Discrete Mathematics

Credit points: 3 **Session:** Semester 2, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1904 or MATH1064 or MATH2011 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1004 is designed to provide a thorough preparation for further study in Mathematics.

This unit provides an introduction to fundamental aspects of discrete mathematics, which deals with 'things that come in chunks that can be counted'. It focuses on the enumeration of a set of numbers, viz. Catalan numbers. Topics include sets and functions, counting principles, discrete probability, Boolean expressions, mathematical induction, linear recurrence relations, graphs and trees.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1904
Discrete Mathematics (Advanced)

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1004 or MATH1064 or MATH2011 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics. It parallels the normal unit MATH1004 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

Statistics units

MATH1005
Statistical Thinking with Data

Credit points: 3 **Session:** Semester 2, Summer Main, Winter Main **Classes:** Lectures 2 hrs/week; Practical 1 hr/week **Prohibitions:** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In a data-rich world, global citizens need to problem solve with data, and evidence based decision-making is essential is every field of research and work.

This unit equips you with the foundational statistical thinking to become a critical consumer of data. You will learn to think analytically about data and to evaluate the validity and accuracy of any conclusions drawn. Focusing on statistical literacy, the unit covers foundational statistical concepts, including the design of experiments, exploratory data analysis, sampling and tests of significance.

Textbooks

Freedman, Pisani and Purves, Statistics, Norton, 2007

MATH1905
Statistical Thinking with Data (Advanced)

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020

Assumed knowledge: (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. This Advanced level unit of study parallels the normal unit MATH1005 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

2000-level units of study

Core

MATH2021
Vector Calculus and Differential Equations

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1XX2) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) **Prohibitions:** MATH2921 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067 **Assessment:** assessment for this unit consists of quizzes, assignments, and a final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit opens with topics from vector calculus, including vector-valued functions (parametrised curves and surfaces; vector fields; div, grad and curl; gradient fields and potential functions), line integrals (arc length; work; path-independent integrals and conservative fields; flux across a curve), iterated integrals (double and triple integrals, polar, cylindrical and spherical coordinates; areas, volumes and mass; Green's Theorem), flux integrals (flow through a surface; flux integrals through a surface defined by a function of two variables, through cylinders, spheres and other parametrised surfaces), Gauss' and Stokes' theorems. The unit then moves to topics in solution techniques for ordinary and partial differential equations (ODEs and PDEs) with applications. It provides a basic grounding in these techniques to enable students to build on the concepts in their subsequent courses. The main topics are: second order ODEs (including inhomogeneous equations), higher order ODEs and systems of first order equations, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series).

Textbooks

As set out in the Intermediate Mathematics Handbook

MATH2921
Vector Calculus and Differential Eqs (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **Prohibitions:** MATH2021 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067 **Assessment:** assessment for this unit consists of quizzes, assignments, and a final exam. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the advanced version of MATH2021, with more emphasis on the underlying concepts and mathematical rigour. The vector calculus component of the course will include: parametrised curves and surfaces, vector fields, div, grad and curl, gradient fields and potential functions, lagrange multipliers line integrals, arc length, work, path-independent integrals, and conservative fields, flux across a curve, double and triple integrals, change of variable formulas, polar, cylindrical and spherical coordinates, areas, volumes and mass, flux integrals, and Green's Gauss' and Stokes' theorems. The Differential Equations half of the course will focus on ordinary and partial differential equations (ODEs and PDEs) with applications with more complexity and depth. The main topics are: second order ODEs (including inhomogeneous equations), series solutions near a regular point, higher order ODEs and systems of first order equations, matrix equations and solutions, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, elementary Sturm-Liouville theory, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series). The unit then moves to topics in solution techniques for ordinary and partial differential equations (ODEs and PDEs) with applications. It provides a more thorough grounding in these techniques to enable students to build on the concepts in their subsequent courses. The main topics are: second order ODEs (including inhomogeneous equations), higher order ODEs and systems of first order equations, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series).

Textbooks

As set out in the Intermediate Mathematics Handbook

MATH2022
Linear and Abstract Algebra

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** MATH1XX2 **Prohibitions:** MATH2922 or MATH2968 or MATH2061 or MATH2961 **Assessment:** quizzes, assignments and final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Linear and abstract algebra is one of the cornerstones of mathematics and it is at the heart of many applications of mathematics and statistics in the sciences and engineering. This unit investigates and explores properties of linear functions, developing general principles relating to the solution sets of homogeneous and inhomogeneous linear equations, including differential equations. Linear independence is introduced as a way of understanding and solving linear systems of arbitrary dimension. Linear operators on real spaces are investigated, paying particular attention to the geometrical significance of eigenvalues and eigenvectors, extending ideas from first year linear algebra. To better understand symmetry, matrix and permutation groups are introduced and used to motivate the study of abstract group theory.

Textbooks

As set out in the Intermediate Mathematics Handbook

MATH2922
Linear and Abstract Algebra (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** MATH1902 or (a mark of 65 or above in MATH1002) **Prohibitions:** MATH2022 or MATH2968 or MATH2061 or MATH2961 **Assessment:** quizzes, assignments and final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Linear and abstract algebra is one of the cornerstones of mathematics and it is at the heart of many applications of mathematics and statistics in the sciences and engineering. This unit is an advanced version of MATH2022, with more emphasis on the underlying concepts and on mathematical rigour. This unit investigates and explores properties of vector spaces, matrices and linear transformations, developing general principles relating to the solution sets of homogeneous and inhomogeneous linear equations, including differential equations. Linear independence is introduced as a way of understanding and solving linear systems of arbitrary dimension. Linear operators on real spaces are investigated, paying particular attention to the geometrical significance of eigenvalues and eigenvectors, extending ideas from first year linear algebra. To better understand symmetry, matrix and permutation groups are introduced and used to motivate the study of abstract group theory. The unit culminates in studying inner spaces, quadratic forms and normal forms of matrices together with their applications to problems both in mathematics and in the sciences and engineering.

Textbooks

As set out in the Intermediate Mathematics Handbook

Selective

MATH2023
Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** lecture 3hrs/week; practice class 1hr/week; tutorial 1hr/week **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1XX2) **Prohibitions:** MATH2923 or MATH3068 or MATH2962 **Assessment:** assessment for this unit consists of quizzes, an assignment, and a final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Analysis grew out of calculus, which leads to the study of limits of functions, sequences and series. It is one of the fundamental topics underlying much of mathematics including differential equations, dynamical systems, differential geometry, topology and Fourier analysis. This unit introduces the field of mathematical analysis both with a careful theoretical framework as well as selected applications. It shows the utility of abstract concepts and teaches an understanding and construction of proofs in mathematics. This unit will be useful to students of mathematics, science and engineering and in particular to future school mathematics teachers, because we shall explain why common practices in the use of calculus are correct, and understanding this is important for correct applications and explanations. The unit starts with the foundations of calculus and the real numbers system. It goes on to study the limiting behaviour of sequences and series of real and complex numbers. This leads naturally to the study of functions defined as limits and to the notion of uniform convergence. Returning to the beginnings of calculus and power series expansions leads to complex variable theory: elementary functions of complex variable, the Cauchy integral theorem, Cauchy integral formula, residues and related topics with applications to real integrals.

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2923
Analysis (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** lecture 3hrs/week; practice class 1hr/week; tutorial 1hr/week **Prerequisites:** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **Prohibitions:** MATH2023 or MATH2962 or MATH3068 **Assessment:** assessment for this unit consists of quizzes, an assignment, and a final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Analysis grew out of calculus, which leads to the study of limits of functions, sequences and series. It is one of the fundamental topics underlying much of mathematics including differential equations, dynamical systems, differential geometry, topology and Fourier analysis. This advanced unit introduces the field of mathematical analysis both with a careful theoretical frame- work as well as selected applications. It shows the utility of abstract concepts and teaches an understanding and construction of proofs in mathematics. This unit will be useful to students with more mathematical maturity who study mathematics, science, or engineering. The unit starts with the foundations of calculus and the real numbers system, with more emphasis on the topology. It goes on to study the limiting behaviour of sequences and series of real and complex numbers. This leads naturally to the study of functions defined as limits and to the notion of uniform con- vergence. Returning to the beginnings of calculus and power series expansions leads to complex variable theory: elementary functions of complex variable, the Cauchy integral theorem, Cauchy integral formula, residues and related topics with applications to real integrals.

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2068
Number Theory and Cryptography

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** 6 credit points of Junior Mathematics units **Prohibitions:** MATH2988 or MATH3009 or MATH3024 **Assumed knowledge:** MATH1014 or MATH1002 or MATH1902 **Assessment:** 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cryptography is the branch of mathematics that provides the techniques for confidential exchange of information sent via possibly insecure channels. This unit introduces the tools from elementary number theory that are needed to understand the mathematics underlying the most commonly used modern public key cryptosystems. Topics include the Euclidean Algorithm, Fermat's Little Theorem, the Chinese Remainder Theorem, Möbius Inversion, the RSA Cryptosystem, the Elgamal Cryptosystem and the Diffie-Hellman Protocol. Issues of computational complexity are also discussed.

MATH2988
Number Theory and Cryptography Advanced

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH19X3 or MATH1907 or (a mark of 65 or above in MATH1023 or MATH1003)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **Prohibitions:** MATH2068 **Assessment:** One 2 hr exam, homework assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is an advanced version of MATH2068, sharing the same lectures but with more advanced topics introduced in the tutorials and computer laboratory sessions.

3000-level units of study

Interdisciplinary project units

MATH3X20 and MATH3X10 to be developed for offering in 2019.

Selective

MATH3061
Geometry and Topology

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3001 or MATH3006 **Assessment:** One 2 hour exam, tutorial tests, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of the unit is to expand visual/geometric ways of thinking. The geometry section is concerned mainly with transformations of the Euclidean plane (that is, bijections from the plane to itself), with a focus on the study of isometries (proving the classification theorem for transformations which preserve distances between points), symmetries (including the classification of frieze groups) and affine transformations (transformations which map lines to lines). The basic approach is via vectors and matrices, emphasising the interplay between geometry and linear algebra. The study of affine transformations is then extended to the study of collineations in the real projective plane, including collineations which map conics to conics. The topology section considers graphs, surfaces and knots from a combinatorial point of view. Key ideas such as homeomorphism, subdivision, cutting and pasting and the Euler invariant are introduced first for graphs (1-dimensional objects) and then for triangulated surfaces (2-dimensional objects). Topics include the classification of surfaces, map colouring, decomposition of knots and knot invariants.

MATH3063
Nonlinear ODEs with Applications

Credit points: 6 **Teacher/Coordinator:** Prof Leon Poladian **Session:** Semester 1 **Classes:** Three lectures, one tutorial per week **Prerequisites:** 12 credit points of Intermediate mathematics **Prohibitions:** MATH3003 or MATH3923 or MATH3020 or MATH3920 or MATH3963 **Assumed knowledge:** MATH2061 or [MATH2X21 and MATH2X22] **Assessment:** Class tests, Assignments, Final examination **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is an introduction to the theory of systems of ordinary differential equations. Such systems model many types of phenomena in engineering, biology and the physical sciences. The emphasis will not be on finding explicit solutions, but instead on the qualitative features of these systems, such as stability, instability and oscillatory behaviour. The aim is to develop a good geometrical intuition into the behaviour of solutions to such systems. Some background in linear algebra, and familiarity with concepts such as limits and continuity, will be assumed. The applications in this unit will be drawn from predator-prey systems, transmission of diseases, chemical reactions, beating of the heart and other equations and systems from mathematical biology.

MATH3066
Algebra and Logic

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 6 credit points of Intermediate Mathematics **Prohibitions:** MATH3062 or MATH3065 **Assessment:** One 2 hour exam (60%), two assignments (15% each), peer review of each assignment (5% each). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study unifies and extends mathematical ideas and techniques that most participants will have met in their first and second years, and will be of general interest to all students of pure and applied mathematics. It combines algebra and logic to present and answer a number of related questions of fundamental importance in the development of mathematics, from ancient to modern times. Classical and novel arithmetics are introduced, unified and described abstractly using field and ring axioms and the language of field extensions. Applications are presented, in particular the unsolvability of the celebrated classical construction problems of the Greeks. Quotient rings are introduced, culminating in a construction of the real numbers, by factoring out rings of Cauchy sequences of rationals by the ideal of null sequences. Axiomatics are placed in the context of reasoning within first order logic and set theory.

The Propositional and Predicate Calculi are studied as model axiomatic systems in their own right, including sketches of proofs of consistency and completeness. The final part of the course introduces precise notions of computability and decidability, through abstract Turing machines, culminating in the unsolvability of the Halting Problem and the undecidability of First Order Logic.

MATH3076
Mathematical Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour laboratory per week. **Prerequisites:** 12 credit points of MATH2XXX and 6 credit points from (MATH1021 or MATH1001 or MATH1023 or MATH1003 or MATH19X1 or MATH19X3 or MATH1906 or MATH1907) **Prohibitions:** MATH3976 or MATH3016 or MATH3916 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to Fortran 95/2003 programming and numerical methods. Topics covered include computer arithmetic and computational errors, systems of linear equations, interpolation and approximation, solution of nonlinear equations, quadrature, initial value problems for ordinary differential equations and boundary value problems.

MATH3078
PDEs and Waves

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3018 or MATH3921 or MATH3978 **Assumed knowledge:** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **Assessment:** One 2 hour exam, assignments, quizzes (100%). To pass MATH3078/3978, students must achieve satisfactory performance in the in-semester assessment component. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces Sturm-Liouville eigenvalue problems and their role in finding solutions to boundary value problems. Analytical solutions of linear PDEs are found using separation of variables and integral transform methods. Three of the most important equations of mathematical physics - the wave equation, the diffusion (heat) equation and Laplace's equation - are treated, together with a range of applications. There is particular emphasis on wave phenomena, with an introduction to the theory of sound waves and water waves.

To pass MATH3078, students must achieve satisfactory performance in the in-semester assessment component in order to pass the unit of study.

MATH3961
Metric Spaces (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics units **Prohibitions:** MATH3001 or MATH3901 **Assumed knowledge:** MATH2923 or MATH2962 **Assessment:** 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Topology, developed at the end of the 19th Century to investigate the subtle interaction of analysis and geometry, is now one of the basic disciplines of mathematics. A working knowledge of the language and concepts of topology is essential in fields as diverse as algebraic number theory and non-linear analysis. This unit develops the basic ideas of topology using the example of metric spaces to illustrate and motivate the general theory. Topics covered include: Metric spaces, convergence, completeness and the contraction mapping theorem; Metric topology, open and closed subsets; Topological spaces, subspaces, product spaces; Continuous mappings and homeomorphisms; Compact spaces; Connected spaces; Hausdorff spaces and normal spaces, Applications include the implicit function theorem, chaotic dynamical systems and an introduction to Hilbert spaces and abstract Fourier series.

MATH3962
Rings, Fields and Galois Theory (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3062 or MATH3902 or MATH3002 **Assumed knowledge:** MATH2922 or MATH2961 **Assessment:** One 2 hour exam, homework assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are advised to take MATH2968 before attempting this unit.

This unit of study investigates the modern mathematical theory that was originally developed for the purpose of studying polynomial equations. The philosophy is that it should be possible to factorize any polynomial into a product of linear factors by working over a "large enough" field (such as the field of all complex numbers). Viewed like this, the problem of solving polynomial equations leads naturally to the problem of understanding extensions of fields. This in turn leads into the area of mathematics known as Galois theory.

The basic theoretical tool needed for this program is the concept of a ring, which generalizes the concept of a field. The course begins with examples of rings, and associated concepts such as subrings, ring homomorphisms, ideals and quotient rings. These tools are then applied to study quotient rings of polynomial rings. The final part of the course deals with the basics of Galois theory, which gives a way of understanding field extensions.

MATH3969
Measure Theory and Fourier Analysis (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorials per week. **Prerequisites:** Credit average or greater in 12 credit points Intermediate Mathematics **Prohibitions:** MATH3909 **Assumed knowledge:** At least 6 credit points of (Intermediate Advanced Mathematics or Senior Advanced Mathematics units) **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Measure theory is the study of such fundamental ideas as length, area, volume, arc length and surface area. It is the basis for the integration theory used in advanced mathematics since it was developed by Henri Lebesgue in about 1900. Moreover, it is the basis for modern probability theory. The course starts by setting up measure theory and integration, establishing important results such as Fubini's Theorem and the Dominated Convergence Theorem which allow us to manipulate integrals. This is then applied to Fourier Analysis, and results such as the Inversion Formula and Plancherel's Theorem are derived. The Radon-Nikodyn Theorem provides a representation of measures in terms of a density. Probability theory is then discussed with topics including distributions and conditional expectation.

MATH3974
Fluid Dynamics (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3914 **Assumed knowledge:** [MATH2961 and MATH2965] or [MATH2921 and MATH2922] **Assessment:** One 2 hour exam (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to fluid dynamics, starting with a description of the governing equations and the simplifications gained by using stream functions or potentials. It develops elementary theorems and tools, including Bernoulli's equation, the role of vorticity, the vorticity equation, Kelvin's circulation theorem, Helmholtz's theorem, and an introduction to the use of tensors. Topics covered include viscous flows, lubrication theory, boundary layers, potential theory, and complex variable methods for 2-D airfoils. The unit concludes with an introduction to hydrodynamic stability theory and the transition to turbulent flow.

MATH3976
Mathematical Computing (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of MATH2XXX and [6 credit points from (MATH1923 or MATH1903 or MATH1933 or MATH1907), or a mark of 65 or above in (MATH1023 or MATH1003)] **Prohibitions:** MATH3076 or MATH3016 or MATH3916 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

See entry for MATH3076 Mathematical Computing.

MATH3977
Lagrangian and Hamiltonian Dynamics (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH2904 or MATH2004 or MATH3917 **Assessment:** One 2 hour exam and assignments and/or quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides a comprehensive treatment of dynamical systems using the mathematically sophisticated framework of Lagrange and Hamilton. This formulation of classical mechanics generalizes elegantly to modern theories of relativity and quantum mechanics. The unit develops dynamical theory from the Principle of Least Action using the calculus of variations. Emphasis is placed on the relation between the symmetry and invariance properties of the Lagrangian and Hamiltonian functions and conservation laws. Coordinate and canonical transformations are introduced to make apparently complicated dynamical problems appear very simple. The unit will also explore connections between geometry and different physical theories beyond classical mechanics.

Students will be expected to solve fully dynamical systems of some complexity including planetary motion and to investigate stability using perturbation analysis. Hamilton-Jacobi theory will be used to elegantly solve problems ranging from geodesics (shortest path between two points) on curved surfaces to relativistic motion in the vicinity of black holes.

This unit is a useful preparation for units in dynamical systems and chaos, and complements units in differential equations, quantum theory and general relativity.

MATH3978
PDEs and Waves (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3078 or MATH3018 or MATH3921 **Assumed knowledge:** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **Assessment:** One 2 hour exam, assignments, quizzes (100%). To pass MATH3078 or MATH3978, students must achieve satisfactory performance in the in-semester assessment component. **Mode of delivery:** Normal (lecture/lab/tutorial) day

As for MATH3078 PDEs and Waves but with more advanced problem solving and assessment tasks. Some additional topics may be included.

MATH3X70, MATH3979, MATH3X11, MATH3X21, MATH3X22, MATH3X23, MATH3X24, MATH3X25, MATH3X26, MATH3X27, MATH3X28, MATH3X29, MATH3X12, MATH3X13, MATH3X14, MATH3X15, MATH3X16, MATH3X17, MATH3X18, MATH3X19 to be developed for offering in 2019.

Medical Science

The Medical Science stream and program provide an interdisciplinary program offered across Disciplines in the School of Medical Sciences and Central Clinical School in the Sydney Medical School, as well as the School of Life and Environmental Sciences in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the stream

The Medical Science stream and program is designed to provide flexible pathways into the myriad of career opportunities in the biomedical sciences.

The medical sciences form the basis for research and development, medicine, dentistry, health sciences, public health, policy and pharmaceutics. They also provide foundational expertise that can be combined with other areas including engineering, information technology, data science, design, commerce and law.

This program capitalises on the diverse nature of the medical sciences by integrating disciplinary depth with multidisciplinary breadth. By providing a strong foundation in physiology, anatomy and biochemistry, alongside other essential medical sciences such as pharmacology, microbiology, pathology, immunobiology and infectious diseases, the program also provides a solid base for prerequisite knowledge for anyone interested in progressing into Medicine and Dentistry.
This program delivers a distinctive and interdisciplinary cohort experience. This starts in first year with human biology and culminates in a 3000-level capstone unit of study that is unique to the program. This capstone allows you to consolidate and demonstrate your knowledge and skills acquired over the three years in an interdisciplinary real world project.

The medical science program is research informed and enquiry-led, leveraging off the world class research and industry strengths of the medical sciences disciplines, Charles Perkins Centre as well as the developments at the Westmead campus. Importantly, the undergraduate degree structure allows students undertaking the Medical Sciences program to take a major in any other area, which provides a foundation in medical sciences that also permits personalized outcomes for students, with the flexibility to couple the program with fields as diverse as information technology, design, philosophy, chemistry, data science and many others.

Requirements for completion

A stream in Medical Science is 72 credit points, consisting of:

(i)6 credit points of 1000-level chemistry units
(ii)6 credit points of 2000-level biochemistry units
(iii)A 60 credit point program in Medical Science

A program in Medical Science requires 60 credit points, consisting of:

(i)A 48 credit point major in Medical Science
(ii)12 credit points of 2000-level program core units

A major in Medical Science requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)6 credit points of 3000-level project and interdisciplinary capstone unit
(iv)18 credit points of 3000-level selective units

First year

Core to Major: BIOL1XX7, MEDS1X01
Core to Stream: CHEM1XX1

Second year

Core to Major: MEDS2004, MEDS2005
Core to Stream: MEDS2003
Core to Program: MEDS2001, MEDS2002

Third year

Core to major: MEDS3001 and 18 credit points from a selection of: AMED3001, AMED3002, AMED3003, AMED3004, ANAT3X07, ANAT3XX4, ANAT3X08, ANAT3X09, BCHM3X71, BCHM3X72, HSTO3003, HSTO3004, IMMU3X11, IMMU3X12, INFD3012, MICR3X11, NEUR3X03, NEUR3X04, NEUR3X05, NEUR3X06, PATH3X11, PATH3X12, PCOL3X11, PCOL3X12, PCOL3X21, PCOL3X22, PHSI3X09, PHSI3X10, PHSI3X11, PHSI3X12, VIRO3X01, VIRO3X02.

To achieve the Medical Science major, alongside the project unit MEDS3001, you can either select from the range of third year units, or choose to do three disciplinary units. This flexibility provides a distinctive opportunity for students seeking a broader exposure to medical sciences.

In your third year you must take MEDS3001 as the designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Medical Science: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

E yvonne.smythe@sydney.edu.au
T +61 2 9351 2841

Address:
School of Medical Sciences
Anderson Stuart Building F13
University of Sydney NSW 2006

Professor Philip Poronnik
E philip.poronnik@sydney.edu.au
T +61 2 9036 3207

Dr Tina Hinton
E tina.hinton@sydney.edu.au
T +61 2 93516954

Learning Outcomes

Students who graduate from Medical Science will be able to:

1. Articulate the methods of science and explaining why current scientific knowledge is both contestable and testable by further inquiry.
2. Explain the role and relevance of biomedical science to society including the translation of biomedical science to clinical and medical outcomes.
3. Demonstrate well-developed knowledge in at least one disciplinary area in the biomedical sciences and integrate knowledge in other disciplinary areas contributing to the biomedical sciences.
4. Collect, synthesize, analyze and critically evaluate scientific data and information from a range of sources.
5. Define a biomedical science problem and formulating a hypotheses and plan an investigation.
6. Select and apply practical and/or theoretical techniques or tools in order to conduct an investigation.
7. Demonstrate creative and innovative approaches to scientific problem solving.
8. Communicate observations and experimental findings and their implications through a broad variety of media to diverse audiences
9. Apply tools to become independent self-managing life-wide learners
10. Work effectively, responsibly and safely in individual and collaborative contexts
11. Understand the ethical and regulatory frameworks relevant to biomedical science and practice academic integrity.

Medical Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MEDICAL SCIENCE			
Medical Science stream			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
The Medical Science stream is 72 credit points, including: (i) 6 credit points of 1000-level chemistry units (ii) 6 credit points of 2000-level biochemistry units (iii) A 60 credit point program in Medical Science			
Medical Science program			
This program is only available to students enrolled in Medical Science stream.			
A program in Medical Science requires 60 credit points from this table including: (i) A 48 credit point major in Medical Science (ii) 12 credit points of 2000-level program core units			
Medical Science major			
This major is only available to students enrolled in Medical Science program.			
A major in Medical Science requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level major core units (iii) 6 credit points of 3000-level project and interdisciplinary capstone unit (iv) 18 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Chemistry units			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
Major core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			
2000-level units of study			
Biochemistry units			
MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
Program core			
MEDS2001 and MEDS2002 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
Major core			
MEDS2004 and MEDS2005 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Project and Interdisciplinary capstone unit			
MEDS3001 unit of study to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
Selective			
AMED3001 **Cancer**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
AMED3002 **Interrogating Biomedical and Health Data**	6	**A** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
AMED3003 **Diagnostics and Biomarkers**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
AMED3004 **Clinical Science**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3007 **Visceral Anatomy**	6	**A** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **N** ANAT3907 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
ANAT3907 **Visceral Anatomy (Advanced)**	6	**A** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** An annual average mark of 70 or above in previous year **N** ANAT3007 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *Note: Department permission required for enrolment* *DEPARTMENTAL PERMISSION REQUIRED*	Semester 1
ANAT3004 **Cranial and Cervical Anatomy**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **N** ANAT3904 or ANAT3994 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3904 **Cranial and Cervical Anatomy (Advanced)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **N** ANAT3004or ANAT3994 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3994 **Cranial and Cervical Anatomy (SSP)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01; demonstrated evidence of manual dexterity and ethical approach **P** A mark of 75 or above in ANAT3907 **N** ANAT3904 or ANAT3004 *Note: Department permission required for enrolment* *Department permission required for enrolment. Course is subject to availability of donor material for dissection.Course is by invitation ONLY.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3008 **Musculoskeletal Anatomy**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **N** ANAT3908 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3908 **Musculoskeletal Anatomy (Advanced)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **N** ANAT3008 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BCHM3071 **Molecular Biology and Biochemistry-Genes**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3971 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3971 **Molecular Biology and Biochem-Genes (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3071 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3072 **Human Molecular Cell Biology**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3972 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3972 **Human Molecular Cell Biology (Advanced)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3072 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
HSTO3003 **Cells and Development: Theory**	6	**A** ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
HSTO3004 **Cells and Development: Practical (Adv)**	6	**A** (ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** An annual average mark of 65 or above in the previous year **C** HSTO3003 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
INFD3012 **Infectious Diseases**	6	**P** BMED2401 and BMED2404 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3011 **Microbes in Infection**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **N** MICR3911 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
MICR3911 **Microbes in Infection (Advanced)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** MICR3011	Semester 1
NEUR3003 **Cellular and Developmental Neuroscience**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **N** NEUR3903 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3903 **Cellular and Developmental Neurosci. (Adv)**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **P** Annual average mark of 70 or above in the previous year **N** NEUR3003 *Note: Department permission required for enrolment* *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3004 **Integrative Neuroscience**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **N** NEUR3904 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3904 **Integrative Neuroscience (Advanced)**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **P** Annual average mark of 70 or above in the previous year **N** NEUR3004 *Note: Department permission required for enrolment* *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3005 **Functional Neuroanatomy**	6	**A** [ANAT2010 or ANAT2910 or (BMED2401 and 12 additional credit points of BMED2402, BMED2403, BMED2405, BMED2406) **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3905 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3905 **Functional Neuroanatomy (Advanced)**	6	**A** [ANAT2010 or ANAT2910) or (BMED2401 and 12 additional credit points of BMED240X) **P** Annual average mark of 70 or above in the previous year **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3005 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3006 **Neural Information Processing**	6	**P** PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X) **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
NEUR3906 **Neural Information Processing (Advanced)**	6	**P** A mark of 75 or above in [PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X)] **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3006 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PCOL3011 **Toxicology**	6	**P** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **N** PCOL3911	Semester 1
PCOL3911 **Toxicology (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **N** PCOL3011	Semester 1
PCOL3012 **Drug Design and Development**	6	**P** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **N** PCOL3912	Semester 1
PCOL3912 **Drug Design and Development (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **N** PCOL3012	Semester 1
PCOL3021 **Drug Therapy**	6	**P** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **N** PCOL3921	Semester 2
PCOL3921 **Drug Therapy (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] **N** PCOL3021	Semester 2
PCOL3022 **Neuropharmacology**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **N** PCOL3922	Semester 2
PCOL3922 **Neuropharmacology (Advanced)**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **P** An annual average mark of 70 or above in the previous year **N** PCOL3022	Semester 2
PHSI3009 **Frontiers in Cellular Physiology**	6	**P** (PHSI2X05 and PHSI2X06) or (BMED2401 and an additional 12 credit points from BMED240X) **N** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3909 *We strongly recommend that students take both (PHSI3009 or PHSI3909) and (PHSI3010 or PHSI3910) units of study concurrently*	Semester 1
PHSI3909 **Frontiers in Cellular Physiology (Adv)**	6	**P** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **N** PHSI3009, PHSI3005, PHSI3905, PHSI3006, PHSI3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PHSI3010 **Reproduction, Development and Disease**	6	**P** (PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02, BIOL2X29, GEGE2X01)] or [12cp from (BMED2402, BMED2403, BMED2406)] **N** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3910 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PHSI3910 **Reproduction, Development and Disease Adv**	6	**P** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02 or BIOL2X29 or GEGE2X01)] or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **N** PHSI3010, PHSI3005, PHSI3905, PHSI3006, PHSI3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PHSI3011 **Frontiers in Whole Body Physiology**	6	**P** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **N** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3911 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3911 **Frontiers in Whole Body Physiology (Adv)**	6	**P** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **N** PHSI3011, PHSI3007, PHSI3907, PHSI3008, PHSI3908 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3012 **Physiology of Disease**	6	**P** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **N** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3912 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3912 **Physiology of Disease (Advanced)**	6	**P** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **N** PHSI3012, PHSI3007, PHSI3907, PHSI3008, PHSI3908 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
VIRO3001 **Virology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3901 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
VIRO3901 **Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** VIRO3001 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
VIRO3002 **Medical and Applied Virology**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3902 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.*	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
VIRO3902 **Medical and Applied Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **N** VIRO3002 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.*	Semester 2
ANAT3X09, IMMU3X11, IMMU3X12, PATH3X11, PATH3X12 to be developed for offering in 2019.			

Medical Science

MEDICAL SCIENCE

Medical Science stream

Advanced coursework and projects will be available in 2020 for students who complete this major.The Medical Science stream is 72 credit points, including:(i) 6 credit points of 1000-level chemistry units(ii) 6 credit points of 2000-level biochemistry units(iii) A 60 credit point program in Medical Science

Medical Science program

This program is only available to students enrolled in Medical Science stream.A program in Medical Science requires 60 credit points from this table including: (i) A 48 credit point major in Medical Science(ii) 12 credit points of 2000-level program core units

Medical Science major

This major is only available to students enrolled in Medical Science program.A major in Medical Science requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level major core units(iii) 6 credit points of 3000-level project and interdisciplinary capstone unit(iv) 18 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Chemistry units

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules.You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions.This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2).You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions.This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Major core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks
TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Biochemistry units

MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

Program core

MEDS2001 and MEDS2002 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

Major core

MEDS2004 and MEDS2005 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Project and Interdisciplinary capstone unit

MEDS3001 unit of study to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

Selective

AMED3001
Cancer

Credit points: 6 **Teacher/Coordinator:** Assoc Prof Scott Byrne **Session:** Semester 1 **Classes:** interactive face to face activities 4 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, assignments, quiz, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

What does it mean when someone tells you: "you have cancer"? Initially you're probably consumed with questions like: "how did this happen?" and "will this cancer kill me?". In this unit, we will explore all aspects of the "cancer problem" from the underlying biomedical and environmental causes, through to emerging approaches to cancer diagnosis and treatment. You will integrate medical science knowledge from a diverse range of disciplines and apply this to the prevention, diagnosis and treatment of cancer both at the individual and community level. Together we will explore the epidemiology, aetiology and pathophysiology of cancer. You will be able to define problems and formulate solutions related to the study, prevention and treatment of cancer with consideration throughout for the economic, social and psychological costs of a disease that affects billions. Face-to-face and online learning activities will allow you to work effectively in individual and collaborative contexts. You will acquire the skills to interpret and communicate observations and experimental findings related to the "cancer problem" to diverse audiences. Upon completion, you will have developed the foundations that will allow you to follow a career in cancer research, clinical and diagnostic cancer services and/or the corporate system that supports the health care system.

Textbooks

Recommended Textbook: 1.,Weinberg (2013) The Biology of Cancer. 2nd edition. Garland Science Recommended reading: 1.,Hanahan and Weinberg (2000). The hallmarks of cancer. Cell 100, 57-70. 2.,Hanahan and Weinberg (2011). Hallmarks of cancer: the next generation. Cell 144, 646-74

AMED3002
Interrogating Biomedical and Health Data

Credit points: 6 **Teacher/Coordinator:** Prof Jean Yang **Session:** Semester 1 **Classes:** face to face 5 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assumed knowledge:** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. **Assessment:** in-semester exam, assignments, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Biotechnological advances have given rise to an explosion of original and shared public data relevant to human health. These data, including the monitoring of expression levels for thousands of genes and proteins simultaneously, together with multiple databases on biological systems, now promise exciting, ground-breaking discoveries in complex diseases. Critical to these discoveries will be our ability to unravel and extract information from these data. In this unit, you will develop analytical skills required to work with data obtained in the medical and diagnostic sciences. You will explore clinical data using powerful, state of the art methods and tools. Using real data sets, you will be guided in the application of modern data science techniques to interrogate, analyse and represent the data, both graphically and numerically. By analysing your own real data, as well as that from large public resources you will learn and apply the methods needed to find information on the relationship between genes and disease. Leveraging expertise from multiple sources by working in team-based collaborative learning environments, you will develop knowledge and skills that will enable you to play an active role in finding meaningful solutions to difficult problems, creating an important impact on our lives.

AMED3003
Diagnostics and Biomarkers

Credit points: 6 **Teacher/Coordinator:** Dr Fabienne Brilot-Turville **Session:** Semester 2 **Classes:** interactive face to face 4 hrs/week; online activities 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, skill based assessments, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Diagnostic sciences have evolved at a rapid pace and provide the cornerstone of our health care system. Effective diagnostic assays enable the identification of people who have, or are at risk of, a disease, and guide their treatment. Research into the pathophysiology of disease underpins the discovery of novel biomarkers and in turn, the development of revolutionary diagnostic assays that make use of state-of-the-art molecular and cellular methods. In this unit you will explore a diverse range of diagnostic tests and gain valuable practical experience in a number of core diagnostic methodologies, many of which are currently used in hospital laboratories. Together we will also cover the regulatory, social, and ethical aspects of the use of biomarkers and diagnostic tests and explore the pathways to their translation into clinical practice. By undertaking this unit, you will develop your understanding of diagnostic assays and biomarkers and acquire the skills needed to embark on a career in diagnostic sciences.

AMED3004
Clinical Science

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Gold **Session:** Semester 2 **Classes:** interactive face to face 4 hrs/week; online activities 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, skill based assessment, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Clinical science is a multidisciplinary science that combines the principles of experimental science with translational medicine. As a clinical scientist, you will have the capacity to interpret test results, isolate causes of disease, and ultimately develop new treatments that will save lives. Clinical Science will provide you with the breadth and depth of knowledge and skills that will give you a broad foundation of knowledge and open up a range of career opportunities in clinical sciences, including medical research, pharmaceutical development and clinical diagnostics. You will learn the language of the clinical world as you develop expertise in literature searching, study design, data interrogation and interpretation, evidence-based decision-making, and current knowledge in medical research. You will explore how discoveries in the medical sciences are translated into clinical practice, and pose your own clinical questions for investigation. You will study important medical conditions from the areas of infectious and genetic diseases and immunity. The capstone experience of your study in Clinical Science will be a short internship in a sector of the clinical sciences of your interest, such as a diagnostic lab, a research lab or a clinical trials centre.

ANAT3007
Visceral Anatomy

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 1 **Classes:** Two 1-hour lectures and two 2-hour tutorials per week. **Prohibitions:** ANAT3907 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) (100%) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to provide an understanding of the anatomy of the viscera of the thorax, abdomen and pelvis. Structures covered include the heart and associated great vessels, lungs, mediastinum and the abdominal viscera, the alimentary organs and the genitourinary system. The structure of anterior thoracic and abdominal walls and pelvis along with the nerve supply to the viscera and relevant endocrine structures is also covered. Emphasis is placed on the relationship of structure to function especially with respect to the important functions of breathing, digestion, excretion and reproduction. Students will be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy.

Textbooks

Rohan, Yokochi and Lutjen-drecoll. Color Atlas of Human Anatomy.

ANAT3907
Visceral Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 1 **Classes:** 2 x 1 hr lectures, 2 x 2 hr tutorials **Prerequisites:** An annual average mark of 70 or above in previous year **Prohibitions:** ANAT3007 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** theory exam, prac exam, continuous assessment (6 quizzes done at intervals during Semester) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy plus further studies of medical images, anatomical features not covered in the mainstream course and details of development of selected head and neck structures. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: DEPARTMENTAL PERMISSION REQUIRED

This unit of study aims to provide an understanding of the anatomy of the viscera of the thorax, abdomen and pelvis. Structures covered include the heart and associated great vessels, lungs, mediastinum and the abdominal viscera, the alimentary organs and the genitourinary system. The structure of anterior thoracic and abdominal walls and pelvis along with the nerve supply to the viscera and relevant endocrine structures is also covered. Emphasis is placed on the relationship of structure to function especially with respect to the important functions of breathing, digestion, excretion and reproduction. Students will be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy. Also further studies of anatomical features not covered in the mainstream course and of details of development of selected head and neck structures.

Textbooks

Rohan, Yokochi and Lutjen-drecoll. Color Atlas of Human Anatomy

ANAT3004
Cranial and Cervical Anatomy

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two 1-hour lectures and two 2-hour tutorials per week **Prerequisites:** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **Prohibitions:** ANAT3904 or ANAT3994 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) (100%) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and CT scans and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Color Atlas of Human Anatomy.

ANAT3904
Cranial and Cervical Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two lectures per week, two hour tutorials per week. **Prerequisites:** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **Prohibitions:** ANAT3004or ANAT3994 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy plus further studies of medical images, anatomical features not covered in the mainstream course and details of development of selected head and neck structures. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy. Also further studies of anatomical features not covered in the mainstream course and of details of development of selected head and neck structures.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Colour Atlas of Human Anatomy.

ANAT3994
Cranial and Cervical Anatomy (SSP)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two lectures per week, one two hour tutorials per week plus three hours dissection per week **Prerequisites:** A mark of 75 or above in ANAT3907 **Prohibitions:** ANAT3904 or ANAT3004 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01; demonstrated evidence of manual dexterity and ethical approach **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester), continuous assessment tasks in dissection **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, plus 3 hours dissection per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Course is subject to availability of donor material for dissection.Course is by invitation ONLY.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. Dissection activities further the understanding of the anatomy of the head and neck and develop highly advanced skills in dissection and prosection of cadaveric materials.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Colour Atlas of Human Anatomy.

ANAT3008
Musculoskeletal Anatomy

Credit points: 6 **Teacher/Coordinator:** Dr Richard Ward **Session:** Semester 2 **Classes:** Two 1-hour lectures, two 2-hour tutorials per week **Prerequisites:** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **Prohibitions:** ANAT3908 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 90 minute paper (70%), one 60 minute paper (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The unit provides an opportunity for students to study the topographical and systems anatomy of the upper limb, lower limb and the back regions. Emphasis is placed upon the identification and description of structures and the correlation of structure with function. This includes for the upper limb, its role in manipulation, for the lower limb standing and walking and for the back flexible support and protection. Emphasis is also given to the innervation of the limbs. The unit also aims to develop the general skills of observation, description, drawing, writing and discussion as applying to biological structure.

ANAT3908
Musculoskeletal Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Richard Ward **Session:** Semester 2 **Classes:** 2 x 1hr lectures **Prerequisites:** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **Prohibitions:** ANAT3008 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 90 minute paper(70%), one practical examination (30%) **Practical field work:** 2 x 2hr Anatomy Wetlab Laboratories **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide an opportunity for students to study the topographical and systems anatomy of the upper limb, lower limb and the back regions. Emphasis is placed upon the identification and description of structures and the correlation of structure with function, which for the upper limb includes its role in manipulation, for the lower limb standing and walking and for the back flexible support and protection. Emphasis is also given to the innervation of the limbs and the consequences of nerve lesions for limb function. The unit also aims to develop the general skills of observation, description, drawing, writing and discussion as applying to biological structure. The unit builds upon or compliments other macroscopic anatomy units offered by the Department and provides for the development of skills, which could be relevant to a later honours project or higher degree in the field of structural biology.

BCHM3071
Molecular Biology and Biochemistry-Genes

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3971 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester practical work and assignments (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3971
Molecular Biology and Biochem-Genes (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3071 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

The lecture component of this unit of study is the same as BCHM3071. Qualified students will attend seminars/practical classes in which more sophisticated topics in gene expression and manipulation will be covered.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3072
Human Molecular Cell Biology

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3972 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BCHM3972
Human Molecular Cell Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3072 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

The lecture component of this unit of study is the same as BCHM3072. Qualified students will attend seminars/practical classes in which more sophisticated topics in modern molecular cell biology will be covered.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

HSTO3003
Cells and Development: Theory

Credit points: 6 **Teacher/Coordinator:** Prof Frank Lovicu **Session:** Semester 2 **Classes:** Four to five 1-hour theory lectures and/or one 1-hour tutorial per week **Assumed knowledge:** ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 2-hour exam, tutorial research papers and Seminar (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The main emphasis of this unit of study concerns the mechanisms that control animal development. Early developmental processes including fertilisation, cleavage, and gastrulation leading to the formation of the primary germ layers and subsequent body organs are described in a range of animals, mainly vertebrates. Stem cells of both embryonic and adult origin will be covered. Emphasis will be placed on the parts played by inductive cell and tissue interactions in cell and tissue differentiation, morphogenesis and pattern formation. This will be studied at both cellular and molecular levels.

Textbooks

Gilbert, SF. Developmental Biology. 11th edition. Sinauer Associates Inc. 2016.

HSTO3004
Cells and Development: Practical (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 2 **Prerequisites:** An annual average mark of 65 or above in the previous year **Corequisites:** HSTO3003 **Assumed knowledge:** (ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Practical class reports and Seminars (100%) **Practical field work:** Two 3-hour practicals per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This advanced unit of study complements HSTO3003 (Cells and Development: Theory) and is catered to provide students with laboratory research experience leading to Honours and higher degrees. It will primarily cover the design and application of experimental procedures involved in cell and developmental biology, using appropriate molecular and cellular techniques to answer developmental questions raised in HSTO3003. This unit of study will promote hands on experience, allowing students to observe and examine developing and differentiating tissues at the macroscopic and microscopic level. The main emphasis of this unit of study will concentrate on practical approaches to understanding the mechanisms that control animal development. Some projects may examine early developmental processes such as fertilization, cleavage, gastrulation and the formation of the primary germ layers and tissues. The parts played by stem cells and inductive cell and tissue interactions in differentiation, morphogenesis and pattern formation can also be examined at cellular and molecular levels.

Textbooks

Gilbert SF. Developmental Biology. 10th edition. Sinauer Associates Inc. 2013.

INFD3012
Infectious Diseases

Credit points: 6 **Teacher/Coordinator:** A/Prof Jamie Triccas **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 4 hour practical class per week. **Prerequisites:** BMED2401 and BMED2404 **Assessment:** Formal examination (60%): one 2 hour exam. Progressive assessment (40%): includes tutorial case presentation, mid-semester quiz and practical assessment. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Infectious diseases occur as a result of interactions between a host and a microbial parasite. This unit of study will explain how infectious agents interact with human hosts at the molecular, cellular, individual patient and community levels to cause diseases and how the hosts attempt to combat these infections. The unit will be taught by the discipline of Infectious Diseases and Immunology of the Department of Medicine within the Central Clinical School, Faculty of Medicine with involvement of associated clinical and research experts who will contribute lectures and theme sessions on their own special interests. The unit will integrate lectures with clinical case studies and hands-on practical sessions to provide students with current knowledge of infectious diseases.

Textbooks

Infectious Diseases: Pathogenesis, Prevention and Case Studies. Edited by Shetty et al. Wiley-Blackwell 2009. ISBN 9781405135436.

MICR3011
Microbes in Infection

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **Prohibitions:** MICR3911 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 2-hour exam; Practical (40%): case study: worksheet, lab work, presentation; one quiz; one 1-hour theory of prac exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The practical component is designed to enhance students' practical skills and to complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR et al. Medical Microbiology. 8th edition. Mosby. 2016.

MICR3911
Microbes in Infection (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week including six 1-hour tutorials, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester. **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** MICR3011 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1.5-hour exam (45%), one essay, one in-semester exam; Practical (40%): case study: worksheet, lab work, presentation; quiz; one 1-hour theory of prac exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is available to students who have performed well in Intermediate Microbiology. This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The unique aspect of this advanced unit that differentiates it from the mainstream unit is six tutorial style sessions that replace six mainstream lectures in the theme 'Emerging and re-emerging diseases'. These dedicated research-led interactive advanced sessions support self-directed learning and involve discussion around specific topics that will vary from year to year. Nominated research papers and reviews in the topic area will be explored with supported discussion of the relevance to and impact of the work on current thinking around emergence of microbial disease. The focus will be on microbial change that lies critically at the centre of understanding the reasons for the emergence of new diseases and challenges in an era of significant scientific ability to diagnose and treat infection. The practical component is identical to the mainstream unit and is designed to enhance students' practical skills and to complement the lectures. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR.et al. Medical Microbiology. 8th ed., Mosby, 2016

NEUR3003
Cellular and Developmental Neuroscience

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Three 1-hour lectures plus one 1-hour tutorial per week. **Prohibitions:** NEUR3903 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Final exam. Mid-semester exam, Major essay/report, attendance and particpation in assessment of Advanced student presentations (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This second semester unit is designed to introduce students to "cutting edge" issues in the neurosciences. This course is a combination of small lectures on current issues in cellular and developmental neuroscience and a research-based library project. Issues covered in the lecture series will include the role of glial on cerebral blood flow and neural transmission, neurochemistry and psychiatric disorders and the development of central and peripheral nervous systems.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition. Elsevier. 2000.

NEUR3903
Cellular and Developmental Neurosci. (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Three 1-hour lectures and one 2-hour lab session per week. **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3003 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Final exam. Mid-semester exam, Mini-lecture presentation and resources, Attendance at and participation in assessment of advanced student presentations (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit encompasses the material taught in NEUR3003. Advanced students perform a research project and present a mini-lecture on a current topic in neuroscience.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition. Elsevier. 2000.

NEUR3004
Integrative Neuroscience

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** One 1-hour lecture, one 2-hour tutorial per week. **Prohibitions:** NEUR3904 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Mid-semester exam, Final exam, 3 short in-semester assessments/reports, Tutorial participation, attendance and at participation in assessment of Advanced student presentations (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This second semester unit is designed to introduce students to "cutting edge" issues in the neurosciences and to be taken in conjunction with NEUR3003. This course is a combination of small group lectures on current issues in neuroscience, seminar groups and a research-based library project. Seminars will be held on topics including imaging pain, emotions, cortical development and plasticity, colour vision, stroke and hypertension, and long-term regulation of blood pressure.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition.

NEUR3904
Integrative Neuroscience (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Up to one 1-hour lecture, one 2-hour tutorial and one two hour laboratory session per week on average. **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3004 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Mid-semester exam, Final exam, Major essay/report, Tutorial participation, Attendance at and participation in assessment of advanced student presentations (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit encompasses the material taught in NEUR3004. Advanced students perform a research project and present a mini-lecture on a current topic in neuroscience research.

BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition.

NEUR3005
Functional Neuroanatomy

Credit points: 6 **Teacher/Coordinator:** Dr Paul Austin **Session:** Semester 1 **Classes:** Two one-hour lectures per week, one guest leacture, 3 two-hour seminars **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3905 **Assumed knowledge:** [ANAT2010 or ANAT2910 or (BMED2401 and 12 additional credit points of BMED2402, BMED2403, BMED2405, BMED2406) **Assessment:** One mid-semester practical quiz (in-class), one final theory exam, one final practical exam, 'Neuroscience in the Media' 3 team-based assessment tasks during seminars and 1 individual written assignment **Practical field work:** Weekly 1.5 hour practical class **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of functional neuroanatomy and systems neuroscience, and an appreciation that neuroscience is a constantly evolving field. There will be a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities. The neural circuits and mechanisms that control somatic and autonomic motor systems, motivated behaviours, emotions, and other higher order functions will be explored in great detail based on current neuroscience literature. Practical classes will allow students to identify and learn the functions of critical anatomical structures in human brain and spinal cord specimens. Reading and interpreting images from functional and structural brain imaging techniques will be incorporated into the neuroanatomy practical classes, and develop an appreciation of how these technologies can be used in neuroscience research. The Neuroscience in the Media seminars will develop neuroscience literature searching skills as well as developing critical thinking and analysis of the accuracy of themedia portrayal of neuroscience research. Building on these skills and working in small groups, students will re-frame and communicate neuroscience evidence through the production of a short video. Students will also learn the skills required to write an unbiased and accurate popular media article based on a recent neuroscience research paper. This unit will develop key attributes that are essential for science graduates as they move forward in their careers.

Textbooks

Nolte's. The Human Brain by Todd Vanderah and Douglas Gould. 7th Ed, Elsevier, 2015
The Human Brain in Photographs and Diagrams by John Nolte. 4th Ed, Mosby, 2013

NEUR3905
Functional Neuroanatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Paul Austin **Session:** Semester 1 **Classes:** Two one-hour lectures per week, 8 one-hour seminars **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3005 **Assumed knowledge:** [ANAT2010 or ANAT2910) or (BMED2401 and 12 additional credit points of BMED240X) **Assessment:** One mid-semester practical quiz (in-class), one final theory exam, one final practical exam, Journal Club participation, Journal Club presentation and 1 individual written assignment **Practical field work:** Weekly 1.5 hour practical class **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of functional neuroanatomy and systems neuroscience, and an appreciation that neuroscience is a constantly evolving field. There will be a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities. The neural circutis and mechanisms that control somatic and autonomic motor systems, motivated behaviours, emotions, and other higher order functions will be explored in great detail based on current neuroscience literature. Practical classes will allow students to identify and learn the functions of critical anatomical structures in human brain and spinal corde specimens. Reading and interpreting images from functional ans tructural brain imaging techniques will be incorporated intot the neuroanatomy practical classes, and develop an appreciation of how these technologies can be used in neuroscience research. By undertaking the advanced unit students will participate in weekly small group seminars under the guidance of a research-active academic. The seminars will take the form of a Journal Club, a style practiced widely in research laboratories around the world. The aim of the Journal Club is to develop critical thinking and detailed knowledge in a specific area of neuroscience research through group discussions. The Journal Club will also develop the skills required to lead a discussion in a small group setting and construct a neuroscience review article. This unit will develop key attributes that are essential for science graduates as they move forward in their careers.

Textbooks

Nolte. Nolte's The Human Brain by Todd. Vanderah and Douglas Gould. 7th Ed, Elsevier, 2015
The Human Brain in Photographs and Diagrams by John Nolte. 4th Ed, Mosby, 2013

NEUR3006
Neural Information Processing

Credit points: 6 **Teacher/Coordinator:** A/Prof Bill Phillips **Session:** Semester 1 **Classes:** two lectures, 1 two-hour research paper session (journal club, 8 weeks) **Prerequisites:** PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X) **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3906 **Assessment:** one 2hr exam, 1500w essay, paper session oral presentation and participation marks, one prac report plus prac quizzes **Practical field work:** 1 x 3hour Prac (total of 5 such practical sessions) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit provides an introduction the mechanisms that drive neurons and neural circuits throughout the brain and body. The lectures explore how signal intensity is translated into nerve impulse codes and how this information is again translated through synapses to convey and interpret information about the external world, to control the body and to record information for future use (learning and memory). We also consider how sensory and motor information is integrated through neural circuits in the brain and spinal cord. Practical classes introduce some of the different ways in which the workings of the brain are studied. Each student chooses a journal club that focuses on a specific topic in neuroscience. In the weekly sessions, group members read, present and interpret original research papers, developing a deep understanding of the emerging scientific evidence in the topic area. This senior year unit of study will develop skills in critical analysis, interpretation and communication of new evidence.

Textbooks

Kandel, Schwartz, Jessel, Sigelbaum, Hudspeth. Principles of Neural Science. 5th Ed, Elsevier, NY, 2013

NEUR3906
Neural Information Processing (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dario Protti **Session:** Semester 1 **Classes:** 1 hour lectures per week **Prerequisites:** A mark of 75 or above in [PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X)] **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3006 **Assessment:** One 2hr exam, prac assessment consisting of one group poster presentation and two short MCQ quizzes, one advanced prac report, one written grant proposal (up to 2,000 words) and oral presentation of grant proposal. **Practical field work:** 1 x 3hour Prac (total of 6 such practical sessions) with the mainstream course and 3-4 x 3 hour advanced pracs. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit provides an introduction into the mechanisms that drive neurons and neural circuits throughout the brain and body. The lectures explore how signal intensity is translated into nerve impulse codes and how this information is again translated through synapses to convey and interpret information about the external world, to control the body and to record information for future use. We also consider how sensory and motor information is integrated through neural circuits in the brain and spinal cord. Practical classes introduce some of the different ways in which the workings of the brain are studied. This senior year unit of study will develop skills in critical analysis, interpretation and communication of new evidence.

Textbooks

Kandel, Schwartz, Jessel, Sigelbaum, Hudspeth. Principles of Neural Science. 5th Ed, Elsevier, NY, 2013

PCOL3011
Toxicology

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every 2 weeks and two practical sessions each 3 hours in length. **Prerequisites:** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **Prohibitions:** PCOL3911 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the discipline of toxicology. The study of toxicology is central to the assessment of drug safety in drug development and in the explanation of toxicology associated with registered drugs (adverse drug reactions) and drug-drug interactions. These issues as well as the pharmacogenetic basis of adverse reactions will be considered. Environmental toxicology, particularly toxic reactions to environmental agents such as asbestos and pesticides, and target organ toxicology (lung, liver, CNS) are also covered. The diverse world of plants and animal toxins will also be explored. As a final consequence of exposure to many toxicants, the biology and causes of cancer are discussed. As part of the unit students are introduced to basic ideas about the collection and analysis of data from human and animal populations, both in the structured situation of clinical trials, forensic problems and in analysis of epidemiological data.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 2 ed. McGraw Hill. 2010, or, by the same authors: Toxicology: The Basic Science of Poisons. 7 ed. McGraw Hill. 2008.

PCOL3911
Toxicology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every second week. and two practical sessions each 3 hours in length **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **Prohibitions:** PCOL3011 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3011. Students will be set special advanced assignments and additional practical data management activities related to the material covered in lectures and practical work. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 3rd ed. McGraw Hill. 2015.. or, by the same authors: Toxicology: The Basic Science of Poisons. 8th ed. McGraw Hill. 2013.

PCOL3012
Drug Design and Development

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **Prohibitions:** PCOL3912 **Assessment:** One 2 hour exam, class and online quizzes, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the field of medicinal chemistry associated with drug design and development. The course covers the fundamental aspects of drug discovery and development with reference to the essentials of chemistry and illustrates drug development with examples that include neuraminidase inhibitors and angiotensin converting enzyme inhibitors. The role of computers in drug design is emphasised by classwork and assignments on molecular modelling and structure-activity relationships. The course also extends to a section on the design of diverse pharmacological agents which include compounds for imaging by positron emission tomography (PET), and kinase inhibitors.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

PCOL3912
Drug Design and Development (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **Prohibitions:** PCOL3012 **Assessment:** One 2 hour exam, in class and online quizzes, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3012. Students will be set special advanced assignments related to the material covered in core areas. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

PCOL3021
Drug Therapy

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, three 2 hour tutorials, three 3 hour practicals, elective project (equivalent to four 3 hour practicals) **Prerequisites:** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **Prohibitions:** PCOL3921 **Assessment:** One 2 hour exam, in lecture tests, practical assignment and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study extends on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of the scientific basis of current and novel approaches to pharmacological treatment for major health challenges of the 21st century. Lecture topics, tutorials and laboratory sessions cover drug treatment of arthritis, cardiovascular disorders, cancer, diabetes and protein misfolding disorders. New approaches to the development of next-generation targeted drugs are also introduced. As part of this course all students will extend the practical skills in understanding scientific literature, statistical analysis, critical problem solving and analytical thinking. Each student will conduct a capstone elective project (laboratory or literature-based) in applied pharmacology supervised by academic members of the department.

Textbooks

Rang and Dale's Pharmacology, 7th edn; Drs. Humphrey P. Rang, Maureen M. Dale, James M. Ritter, Rod Flower, and Graeme Henderson (Churchill Livingstone).

PCOL3921
Drug Therapy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, three 2 hour tutorials-advanced material, three 3 hour practicals, elective project (equivalent to four 3 hour practicals, preference given for laboratory-based project). **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] **Prohibitions:** PCOL3021 **Assessment:** One 2 hour exam, two lecture tests, practical assignment and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the same lecture series as PCOL3021. The tutorials and practical sessions will extend the work provided in PCOL321 to challenge deeper learning in the effect of drug therapy on pathophysiology of chronic diseases.

Textbooks

Rang and Dale's Pharmacology, 7th edn; Drs. Humphrey P. Rang, Maureen M. Dale, James M. Ritter, Rod Flower, and Graeme Henderson (Churchill Livingstone).

PCOL3022
Neuropharmacology

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prohibitions:** PCOL3922 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

PCOL3922
Neuropharmacology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prerequisites:** An annual average mark of 70 or above in the previous year **Prohibitions:** PCOL3022 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

PHSI3009
Frontiers in Cellular Physiology

Credit points: 6 **Teacher/Coordinator:** A/Prof Anuwat Dinudom **Session:** Semester 1 **Classes:** 2 x 1hr/ week lectures and 6 x 2 hr large class tutorials (PBL) per semester **Prerequisites:** (PHSI2X05 and PHSI2X06) or (BMED2401 and an additional 12 credit points from BMED240X) **Prohibitions:** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3909 **Assessment:** four in-class quizzes, one mid-semester exam, one 2hr final exam, two presentations for problem-based learning and 1 practical class report **Practical field work:** 3 x 4 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: We strongly recommend that students take both (PHSI3009 or PHSI3909) and (PHSI3010 or PHSI3910) units of study concurrently

The aim of this unit is to provide students with advanced knowledge of cellular physiology. There will be a detailed exploration of the signals and pathways cells use to detect and respond to environmental changes and cues. Important signalling systems and homeostatic regulators will be discussed in the context of biological processes and human diseases. Problem-based learning sessions will explore these diseases with student-led teaching. Practical classes will explore physiological techniques for investigating cell signalling and the biophysical properties of cells. Large class tutorials will focus on graduate attribute skills development in the context of reinforcing material discussed in the lectures and practical classes. This unit will develop key attributes that are essential for a science graduate as they move forward in their careers.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3909
Frontiers in Cellular Physiology (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Anuwat Dinudom **Session:** Semester 1 **Classes:** 2 x 1hr/ week lectures and 3 x 2 hrs large class tutorials (PBL) per semester **Prerequisites:** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **Prohibitions:** PHSI3009, PHSI3005, PHSI3905, PHSI3006, PHSI3906 **Assessment:** four in-class quizzes, one mid-semester exam, one 2hr final exam, one presentations for problem-based learning and one Advanced research report **Practical field work:** 3 x 4 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of cellular physiology. There will be a detailed exploration of the signals and pathways cells use to detect and respond to environmental changes and cues. Important signalling systems and homeostatic regulators will be discussed in the context of biological processes and human diseases. Problem-based learning sessions will explore these diseases with student-led teaching. Practical classes will explore physiological techiques for investigating cell signalling and biophysical properties of cells. Large class tutorials will focus on graduate attribute skills development in the context of reinforcing material discussed in the lectures and practical classes. This unit will develop key attributes that are essential for science a graduate as they move forward in their careers.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3010
Reproduction, Development and Disease

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 1 **Classes:** 2 x 1hr lectures per week; 1 guest lecture/problem-based learning class introduction/organisation session per week. 2 x 3 hour problem-based learning classes per semester. **Prerequisites:** (PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02, BIOL2X29, GEGE2X01)] or [12cp from (BMED2402, BMED2403, BMED2406)] **Prohibitions:** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3910 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, two problem-solving learning tutorials, 3 practical class reports **Practical field work:** 3 x 3 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of the physiological processes that regulate normal and how these may go awry leading to significant human conditions or even disease. Lectures will focus on; male and female reproductive physiology, endocrinology of reproduction, physiology of fertilisation, cell cycle control and apoptosis, mechanisms of differentiation, gastrulation, cardiovascular development, tissue formation and organogenesis, stem cell biology and the link between developmental processes and cancer. Reprogramming and tissue regeneration will also feature in the lecture content. Problem-based learning will focus on reproductive physiology and regeneration. Practical classes will examine the processes regulating sperm function, embryogenesis and stem cell biology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3910
Reproduction, Development and Disease Adv

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 1 **Classes:** 2 x 1hr lectures per week; 1 guest lecture/problem-based learning class introduction/organisation session per week; 2 x 3 hour stem cell laboratory presentations per semester. **Prerequisites:** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02 or BIOL2X29 or GEGE2X01)] or

[12cp from (BMED2402 or BMED2403 or BMED2406)]} **Prohibitions:** PHSI3010, PHSI3005, PHSI3905, PHSI3006, PHSI3906 **Assessment:** one mid-semester MCQ exam, one 2hr final exam,stem cell labortory class (2 presentations), 3 practical class reports **Practical field work:** 4 x 4 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of the physiological processes that regulate normal and how these may go awry leading to significant human conditions or even disease. Lectures will focus on; male and female reproductive physiology, endocrinology of reproduction, physiology of fertilisation, cell cycle control and apoptosis, mechanisms of differentiation, gastrulation, cardiovascular development, tissue formation and organogenesis, stem cell biology and the link between developmental processes and cancer. Reprogramming and tissue regeneration will also feature in the lecture content. . Practical classes will examine the processes regulating sperm function, embryogenesis and stem cell biology. Students enrolling in PHSI3910 complete a separate laboratory class centered on stem cell differentiation to replace the problem-based learning exercises in PHSI3010.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3011
Frontiers in Whole Body Physiology

Credit points: 6 **Teacher/Coordinator:** Prof Phillip Poronnik **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 4 x 2 hr class tutorials per semester (Week 3 and 13) and 2 x 1 hr tutorial preparation session (week 2 and 12), one contcept based learning tutorial 3 x 2 hours **Prerequisites:** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **Prohibitions:** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3911 **Assessment:** one mid-semester exam, one 2hr final exam, two tutorial reports, 3 practical class reports **Practical field work:** 3 x 4 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate homeostasis throughout the whole body with a particular focus not only on the interplay between major organ systems, but also variability amongst individuals. The emphasis in this unit is on recent advances at the frontiers of human physiology. Our current understandings of how we functions will be explored at the molecular, cellular and whole body level. This is detailed fundamental knowledge that is key to understanding the transitions that occur from health to disease. Hands on practical classes will explore the physiology presented in the lectures and tutorial sessions will investigate what 'normal' is in terms of whole body physiology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science; Siverthorn D, Human Physiology: an integrated approach. 7th Edition Pearson.

PHSI3911
Frontiers in Whole Body Physiology (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Phillip Poronnik **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 4 x 2 hr class tutorials per semester (Week 3 and 13) and 2 x 1 hr tutorial preparation session (week 2 and 12), one contcept based learning tutorial 3 x 2 hours **Prerequisites:** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **Prohibitions:** PHSI3011, PHSI3007, PHSI3907, PHSI3008, PHSI3908 **Assessment:** one mid-semester exam, one 2hr final exam, two tutorial reports, 3 practical class reports **Practical field work:** 3 x 4 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate homeostasis throughout the whole body with a particular focus not only on the interplay between major organ systems, but also variability amongst individuals. The emphasis in this unit is on recent advances at the frontiers of human physiology. Our current understandings of how we functions will be explored at the molecular, cellular and whole body level. This is detailed fundamental knowledge that is key to understanding the transitions that occur from health to disease. Hands on practical classes will explore the physiology presented in the lectures and tutorial sessions will investigate what Â¿normalÂ¿ is in terms of whole body physiology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science; Siverthorn D, Human Physiology: an integrated approach. 7th Edition Pearson.

PHSI3012
Physiology of Disease

Credit points: 6 **Teacher/Coordinator:** A/Prof Matthew Naylor **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 12 x 1hr tutorials (weeks 3-5 and 8-10 only), 2 x 6hr practical (weeks 4-5 and 8-9). **Prerequisites:** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **Prohibitions:** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3912 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, two problem-solving learning tutorials, 2 practical class reports **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate normal homeostasis throughout the whole body and how defects in these processes can lead to significant human disease. The emphasis in this unit is on recent advances at the frontiers of human physiology. The processes leading to cancer, cardiovascular and metabolic disease will be explored at the molecular, cellular and whole body level. Problem-based learning will focus on cancer and cardiovascular disease and practical classes will utilise both wet lab and online resources to dissect the processes by which normal physiological processes become aberrant leading to human disease.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3912
Physiology of Disease (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Matthew Naylor **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 2 x 6hr practical (weeks 4-5 and 8-9), Advanced project. **Prerequisites:** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **Prohibitions:** PHSI3012, PHSI3007, PHSI3907, PHSI3008, PHSI3908 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, Advanced project report, 2 practical class reports **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate normal homeostasis throughout the whole body and how defects in these processes can lead to significant human disease. The emphasis in this unit is on recent advances at the frontiers of human physiology. The processes leading to cancer, cardiovascular and metabolic disease will be the specific will be explored at the molecular, cellular and whole body level. Students will undertake an Advanced Project Problem-based learning will focus on cancer and cardiovascular disease and Practical classes will utilise both wet lab and online resources to dissect the processes by which normal physiological processes become aberrant leading to human disease.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

VIRO3001
Virology

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 26 1-hour lectures, seven 4-hour practical classes, one 2-hour tutorial **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3901 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam (60%) (120 minutes). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novel vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluorescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Tutorials cover a range of topical issues and provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3901
Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 29 1-hour lectures, seven 4-hour practical classes, four 1-hour tutorials **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** VIRO3001 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), individual presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam: (60%) (120 minutes) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Intermediate Microbiology and is based on VIRO3001 with additional lectures related to the research interests in the Discipline. Consequently, the unit of study content may change from year to year. Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novle vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluroescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Advanced lectures cover cutting-edge research in the field of virology in small group discussions and presentations that provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3002
Medical and Applied Virology

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1-hour lectures per week **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3902 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment and oral presentation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. Practical session slots are also used for oral presentations. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.

This unit of study explores diseases in human caused by viruses, with focus on the way viruses infect individual patients and spread in the community, and how virus infections are diagnosed, treated and/or prevented. Host/Virus interactions will also be described with a focus on the viral mechanisms that have evolved to combat and/or evade host defence systems. These features will be used to explain the symptoms, spread and control of the most medically important viruses that cause serious disease in humans . The unit will be taught by the Discipline of Infectious Diseases and Immunology within the Sydney Medical School with the involvement of associated clinical and research experts who will contribute lectures on their own special interests and with contributions from the Discipline of Microbiology. In the practical classes students will have the opportunity to develop their skills in performing methods currently used in diagnostic and research laboratories such as molecular analysis of viral genomes, immunofluorescent staining of viral antigens, cell culture and the culture of viruses.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3902
Medical and Applied Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, and one interactive 2-hour tutorials (approx 6 in total, including for oral presentations) **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **Prohibitions:** VIRO3002 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment, oral presentation and tutorial participation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.

This unit is based on the VIRO3002 course with inclusion of tutorials, including with leading research medical virologists, enabling students to gain additional experience with cutting edge virology research. The content of this unit may change from year to year based on research interests within the department.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

ANAT3X09, IMMU3X11, IMMU3X12, PATH3X11, PATH3X12 to be developed for offering in 2019.

Medicinal Chemistry

Medicinal Chemistry is a multi-disciplinary major offered by the Discipline of Pharmacology in the Sydney Medical School and the School of Chemistry in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

The Medicinal Chemistry major will provide you with the knowledge, training and skills needed for possible employment and research opportunities in drug discovery and development.

The discovery of new drugs is one of the most exciting and rapidly developing fields in science, and there is a growing need for safer, more effective pharmaceuticals against diseases, including cancer, cardiovascular disease and HIV/AIDS, in addition to diseases that are becoming more widespread, such as malaria and tuberculosis.

Society also faces challenges ranging from antimicrobial resistance and dementia, with the latter of special significance in the context of the aging population. Medicinal chemistry looks at how to design and prepare drugs to combat and manage these diseases, and the mechanism of action (how the drugs work).

Requirements for completion

A major in Medicinal Chemistry requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)12 credit points of 3000-level core units
(iv)6 credit points of 3000-level selective chemistry units
(v)6 credit points of 3000-level selective pharmacology units

A minor in Medicinal Chemistry is available and articulates to this major.

First year

1000-level Chemistry units are offered in two halves, Chemistry 1A (CHEM1XX1), which should be taken first, and Chemistry 1B (CHEM1XX2). Each of these is offered at four levels (Fundamentals, mainstream, Advanced, and the Special Studies Program) to suit the background and interests of students. These units underpin the Medicinal Chemistry major and will provide a solid understanding of chemical structure and reactivity.

Second year

CHEM2401/2911/2915 includes an extension of the skills and knowledge acquired in 1000-level Chemistry and provide the broad base for further specialisation in the third year of the medicinal chemistry major.

PCOL2011 provides the fundamental grounding in four basic areas in Pharmacology: (1) principles of drug action (2) pharmacokinetics and drug metabolism (3) experimental design and autonomic pharmacology, and (4) drug design. The delivery of material involves lectures, practicals, computer-aided learning and problem-based workshops. Practical classes provide students with the opportunity of acquiring technical experience and teamwork skills. Problem-based workshops are based on real-life scenarios of drug use in the community. These workshops require students to integrate information obtained in lectures in order to provide solutions to the problems. Online quizzes accompany each module and are to encourage continued learning throughout the semester.

Third year

MCHM3X01 and MCHM3X02 are the core units available to students on the Medicinal Chemistry major, and provide the essential knowledge and understanding relevant to drug discovery and design at an advanced level. Students may make a choice from remaining Chemistry and Pharmacology units of study, though are recommended to take 6 credit points from a selection of: CHEM3X10 and CHEM3X15, and 6 credit points from a selection of: PCOL3X11 and PCOL3X12.

In your third year you will have the opportunity to take at least one designated project unit that provides disciplinary and interdisciplinary learning in a practical and project based setting.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Medicinal Chemistry: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

E chemistry.enquiries@sydney.edu.au
T +61 2 9351 4504

Addresses:
The School of Chemistry
Chemistry Building F11
University of Sydney NSW 2006
or
The Discipline of Pharmacology
Molecular Bioscience Building G08
University of Sydney NSW 2006

Learning Outcomes

Students who graduate from Medicinal Chemistry will know:

1. The major current themes in modern drug discovery, ranging from combinatorial synthetic methods to fragment-based screening (an example of Depth of Disciplinary Expertise).
2. How advances in science and technology are changing the way in which drug discovery and development is being pursued, and against which diseases (an example of Interdisciplinary Effectiveness).
3. How genomics, proteomics and metabolomics are applied to drug target validation.
4. The nature and impact of pharmacogenomics and pharmacoepidemiology.
5. The processes involved in translating a therapeutic to market.

Students will be able to:

1. Draw upon their training to judge a drug candidate vs. important criteria for development, such as physicochemical properties and synthetic accessibility
2. Independently propose and justify reasonable and efficient synthetic approaches towards small organic molecule drug candidates (an example of Inventiveness)
3. Collaboratively design a strategy to identify and validate a disease-specific target
4. Assess the efficacy of drug action against genomic and proteomic variation
5. Formulate an application for approval and registration of a new drug, generic or biosimiliar.

Medicinal Chemistry

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
MEDICINAL CHEMISTRY			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Medicinal Chemistry major			
A major in Medicinal Chemistry requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective chemistry units (v) 6 credit points of 3000-level selective pharmacology units			
Medicinal Chemistry minor			
A minor in Medicinal Chemistry requires 36 credit points from this table including: (i) 12 credit points 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
CHEM1012 **Fundamentals of Chemistry 1B**	6	**P** CHEM1XX1 **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992	Semester 2
CHEM1112 **Chemistry 1B**	6	**P** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992	Semester 1 Semester 2
CHEM1912 **Chemistry 1B (Advanced)**	6	**P** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 *Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1992 **Chemistry 1B (Special Studies Program)**	6	**P** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 *Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.*	Semester 2
2000-level units of study			
Core			
CHEM2401 **Molecular Reactivity and Spectroscopy**	6	**A** 6cp MATH1XXX **P** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 or CHEM2915 *This is a required chemistry unit of study for students intending to major in chemistry.*	Semester 1
CHEM2911 **Molecular Reactivity and Spectroscopy Adv**	6	**A** 6cp MATH1XXX **P** (A mark of 65 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 65 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2915	Semester 1
CHEM2915 **Molecular Reactivity and Spectroscopy SSP**	6	**A** 6cp MATH1XXX **P** (A mark of 75 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 75 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 *Note: Department permission required for enrolment* *The number of places in this unit of study is strictly limited and entry is by invitation only. Enrolment is conditional upon available places.*	Semester 1
PCOL2011 **Pharmacology Fundamentals**	6	**A** BIOL1XXX or MBLG1XX1 **P** 6cp from CHEM1XXX **N** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
3000-level units of study			
Core			
MCHM3X01 and MCHM3X02 to be developed for offering in 2019.			
Chemistry units			
CHEM3110 **Biomolecules: Properties and Reactions**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3910	Semester 1
CHEM3910 **Biomolecules: Properties and Reactions Adv**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3110	Semester 1
CHEM3115 **Synthetic Medicinal Chemistry**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3915	Semester 2
CHEM3915 **Synthetic Medicinal Chemistry (Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3115	Semester 2
Pharmacology units			
PCOL3011 **Toxicology**	6	**P** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **N** PCOL3911	Semester 1
PCOL3911 **Toxicology (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **N** PCOL3011	Semester 1
PCOL3012 **Drug Design and Development**	6	**P** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **N** PCOL3912	Semester 1
PCOL3912 **Drug Design and Development (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **N** PCOL3012	Semester 1

Medicinal Chemistry

MEDICINAL CHEMISTRY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Medicinal Chemistry major

A major in Medicinal Chemistry requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units(iii) 12 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective chemistry units (v) 6 credit points of 3000-level selective pharmacology units

Medicinal Chemistry minor

A minor in Medicinal Chemistry requires 36 credit points from this table including:(i) 12 credit points 1000-level core units (ii) 12 credit points of 2000-level core units(iii) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic

orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1012
Fundamentals of Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1XX1 **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Fundamentals of Chemistry 1B is built on a satisfactory prior knowledge of Fundamentals of Chemistry 1A. Compared to the mainstream Chemistry 1B, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1112
Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2 **Classes:** 1x3-hr lecture; 1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviours, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do we develop lotions that don't burn us, how do we measure UV absorption by sunscreens, how can we measure and alter soil pH, how are sticky things made, and how do we determine the concentration of vitamin C in juice? Through enquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B is built on a satisfactory prior knowledge of Chemistry 1A.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1912
Chemistry 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B (Advanced) is built on a satisfactory prior knowledge of Chemistry 1A (Advanced). Compared to the mainstream Chemistry 1B, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1992
Chemistry 1B (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 12 weeks **Prerequisites:** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 **Assessment:** quizzes, assignment, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how food and medicines work, the properties of materials and substances. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as a demonstrated aptitude. Chemistry 1B (Special Studies Program) is restricted to students who have gained a Distinction in Chemistry 1A (Special Studies Program) or by invitation. The practical work syllabus for Chemistry 1B (Special Studies Program) is very different from that for Chemistry 1B and Chemistry 1B (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1B (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

2000-level units of study

Core

CHEM2401
Molecular Reactivity and Spectroscopy

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 1 **Classes:** Three 1-hour lectures per week, seven 1-hour tutorials per semester, eight 4-hour practicals per semester **Prerequisites:** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **Prohibitions:** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 or CHEM2915 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a required chemistry unit of study for students intending to major in chemistry.

This is one of the two core units of study for students considering majoring in chemistry, and for students of other disciplines who wish to acquire a good general background in chemistry. The unit considers fundamental questions of molecular structure, chemical reactivity, and molecular spectroscopy: What are chemical reactions and what makes them happen? How can we follow and understand them? How can we exploit them to make useful molecules? This course includes the organic and medicinal chemistry of aromatic and carbonyl compounds, organic reaction mechanisms, molecular spectroscopy, quantum chemistry, and molecular orbital theory.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2911
Molecular Reactivity and Spectroscopy Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 1 **Classes:** Three 1-hour lectures per week, seven 1-hour tutorials per semester and eight 4-hour practicals per semester **Prerequisites:** (A mark of 65 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 65 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **Prohibitions:** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2915 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The syllabus for this unit is the same as that of CHEM2401 together with special Advanced material presented in the practical program. The lectures cover fundamental consideration of molecular electronic structure and its role in molecular reactivity and spectroscopy and include applications of spectroscopy, the organic chemistry of aromatic systems, molecular orbital theory and quantum chemistry. For more details of the lecture syllabus, please read the entry for CHEM2401.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2915
Molecular Reactivity and Spectroscopy SSP

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 1 **Classes:** Three 1-hour lectures per week, twelve 1-hour SSP seminars per semester, eight 4-hour practicals per semester **Prerequisites:** (A mark of 75 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 75 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **Prohibitions:** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, assignments, lab reports and final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: The number of places in this unit of study is strictly limited and entry is by invitation only. Enrolment is conditional upon available places.

The lectures for this unit comprise the lectures for CHEM2401 and the Advanced practical program together with additional SSP seminars.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

PCOL2011
Pharmacology Fundamentals

Credit points: 6 **Teacher/Coordinator:** Dr Hilary Lloyd **Session:** Semester 1 **Classes:** Lectures (2 x1 hr per week); wet and dry labs (5 x4 hrs), data anaylsis tutorials (2 x 2 hrs); workshops (6 x 2 hrs) **Prerequisites:** 6cp from CHEM1XXX **Prohibitions:** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XXX or MBLG1XX1 **Assessment:** In-semester (40%), which consists of 4 x on-line quizzes, 2 x lab reports, 3 x research topics, 1 x oral presentation, end-of-semester examination (60%), which consists of multiple choice and short answer questions **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides the fundamental grounding in four basic areas in Pharmacology: (1) principles of drug action (2) pharmacokinetics and drug metabolism (3) experimental design and autonomic pharmacology, and (4) drug design. The delivery of material involves lectures, practicals, computer-aided learning and problem-based workshops. Practical classes provide students with the opportunity of acquiring technical experience and teamwork skills. Problem-based workshops are based on real-life scenarios of drug use in the community. These workshops require students to integrate information obtained in lectures in order to provide solutions to the problems. Online quizzes accompany each module and are to encourage continued learning throughout the semester.

Textbooks

Rang and Dale's Pharmacology, 8th Edition. H. P. Rang, J. M. Ritter, R. J. Flower, and G. Henderson, (Elsevier 2016). Medical Pharmacology at a Glance, 7th edn M.J. Neal: (Blackwell Scientific Publications, 2012).

3000-level units of study

Core

MCHM3X01 and MCHM3X02 to be developed for offering in 2019.

Chemistry units

CHEM3110
Biomolecules: Properties and Reactions

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures and two 4-hour practicals per week for half of semester **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3910 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

DNA, proteins and carbohydrates represent three classes of essential biomolecules present in all biological systems. This unit will cover the structure, reactivity and properties of biomolecules and the building blocks from which these molecules are assembled. Interactions between biomolecules and metalions, small molecules and other biomolecules will be covered and the chemical tools for studying biomolecules highlighted. The design and synthesis of small molecules which mimic the functions of biomolecules will also be illustrated.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3910
Biomolecules: Properties and Reactions Adv

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3110 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

DNA, proteins and carbohydrates represent three classes of essential biomolecules present in all biological systems. This unit will cover the structure, reactivity and properties of biomolecules and the building blocks from which these molecules are assembled. Interactions between biomolecules and metal ions, small molecules and other biomolecules will be covered and the chemical tools for studying biomolecules highlighted. The design and synthesis of small molecules which mimic the functions of biomolecules will also be illustrated. CHEM3910 students attend the same lectures as CHEM3110 students but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3115
Synthetic Medicinal Chemistry

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and two 4-hour practicals per week for half of semester. **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3915 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The development of new pharmaceuticals fundamentally relies on the ability to design and synthesize new compounds. Synthesis is an enabling discipline for medicinal chemistry - without it, the development of new drugs cannot progress from design to implementation, and ultimately to a cure. This unit will tackle important factors in drug design, and will highlight the current arsenal of methods used in the discovery of new drugs, including rational drug design, high throughput screening and combinatorial chemistry. We will develop a logical approach to planning a synthesis of a particular target structure. The synthesis and chemistry of heterocycles, which comprise some 40% of all known organic compounds and are particularly common in pharmaceuticals, will be outlined. Examples will include important ring systems present in biological systems, such as pyrimidines and purines (DNA and RNA), imidazole and thiazole (amino acids and vitamins) and porphyrins (natural colouring substances and oxygen carrying component of blood). Throughout the course, the utility of synthesis in medicinal chemistry will be illustrated with case studies such as anti-influenza (Relenza), anaesthetic (benzocaine), anti-inflammatory (Vioxx), antihypertensive (pinacidil) and cholesterol-lowering (Lovastatin) drugs.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3915
Synthetic Medicinal Chemistry (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3115 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The development of new pharmaceuticals fundamentally relies on the ability to design and synthesize new compounds. Synthesis is an enabling discipline for medicinal chemistry - without it, the development of new drugs cannot progress from design to implementation, and ultimately to a cure. This unit will tackle important factors in drug design, and will highlight the current arsenal of methods used in the discovery of new drugs, including rational drug design, high throughput screening and combinatorial chemistry. We will develop a logical approach to planning a synthesis of a particular target structure. The synthesis and chemistry of heterocycles, which comprise some 40% of all known organic compounds and are particularly common in pharmaceuticals, will be outlined. Examples will include important ring systems present in biological systems, such as pyrimidines and purines (DNA and RNA), imidazole and thiazole (amino acids and vitamins) and porphyrins (natural colouring substances and oxygen carrying component of blood). Throughout the course, the utility of synthesis in medicinal chemistry will be illustrated with case studies such as anti-influenza (Relenza), anaesthetic (benzocaine), anti-inflammatory (Vioxx), antihypertensive (pinacidil) and cholesterol-lowering (Lovastatin) drugs. CHEM3915 students attend the same lectures as CHEM3115 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

Pharmacology units

PCOL3011
Toxicology

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every 2 weeks and two practical sessions each 3 hours in length. **Prerequisites:** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **Prohibitions:** PCOL3911 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the discipline of toxicology. The study of toxicology is central to the assessment of drug safety in drug development and in the explanation of toxicology associated with registered drugs (adverse drug reactions) and drug-drug interactions. These issues as well as the pharmacogenetic basis of adverse reactions will be considered. Environmental toxicology, particularly toxic reactions to environmental agents such as asbestos and pesticides, and target organ toxicology (lung, liver, CNS) are also covered. The diverse world of plants and animal toxins will also be explored. As a final consequence of exposure to many toxicants, the biology and causes of cancer are discussed. As part of the unit students are introduced to basic ideas about the collection and analysis of data from human and animal populations, both in the structured situation of clinical trials, forensic problems and in analysis of epidemiological data.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 2 ed. McGraw Hill. 2010, or, by the same authors: Toxicology: The Basic Science of Poisons. 7 ed. McGraw Hill. 2008.

PCOL3911
Toxicology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every second week. and two practical sessions each 3 hours in length **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **Prohibitions:** PCOL3011 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3011. Students will be set special advanced assignments and additional practical data management activities related to the material covered in lectures and practical work. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 3rd ed. McGraw Hill. 2015.. or, by the same authors: Toxicology: The Basic Science of Poisons. 8th ed. McGraw Hill. 2013.

PCOL3012
Drug Design and Development

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **Prohibitions:** PCOL3912 **Assessment:** One 2 hour exam, class and online quizzes, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the field of medicinal chemistry associated with drug design and development. The course covers the fundamental aspects of drug discovery and development with reference to the essentials of chemistry and illustrates drug development with examples that include neuraminidase inhibitors and angiotensin converting enzyme inhibitors. The role of computers in drug design is emphasised by classwork and assignments on molecular modelling and structure-activity relationships. The course also extends to a section on the design of diverse pharmacological agents which include compounds for imaging by positron emission tomography (PET), and kinase inhibitors.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

PCOL3912
Drug Design and Development (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **Prohibitions:** PCOL3012 **Assessment:** One 2 hour exam, in class and online quizzes, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3012. Students will be set special advanced assignments related to the material covered in core areas. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

Microbiology

Study in the Discipline of Microbiology is offered by the School of Life and Environmental Sciences in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the major

Microbiology teaches us about life forms that are too small to see with the naked eye. They are vital for life on Earth but can also cause huge problems as infectious disease agents, plant pathogens, contaminants of food and water and biofoulers. A major in Microbiology introduces you to this tremendous diversity of function and form in the microbial world. You explore the impact of microbes on other life forms, look at their role in health and disease at the level of individuals, populations and ecosystems, and in particular their place in the One Health nexus of human, animal and environmental inter-relationships. You will investigate ways in which microbes are used to manufacture products and remediate polluted environments and explore microbial genetics and microbial life at the molecular level, with a particular emphasis on current research in Microbiology in our 3000-level units.

By progressing through the major students will learn advanced concepts and methods including molecular microbiology, systems biology, genomics, transcriptomics and proteomics, advanced microscopy techniques, genetic manipulation, microbial evolution, and the use of antimicrobials and antimicrobial resistance.

Requirements for completion

A major in Microbiology requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level major core units
(iii)6 credit points of 3000-level project and interdisciplinary capstone unit
(iv)18 credit points of 3000-level selective units

A minor in Microbiology is available and articulates to this major.

First year

BIOL1XX7 and 6 credit points from a selection of: BIOL1XX6, CHEM1XX1.

Second year

Core: MICR2X31 and MICR2X22 (BMED2404 only available to students enrolled in the Medical Science stream).

Third year

Core: MICR3X11, MICR3X32, MICR3X42 and VIRO3X01.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Microbiology: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9036 5417

Address:
Room 435, Molecular Bioscience Building G08
University of Sydney NSW 2006

Professor Dee Carter
E dee.carter@sydney.edu.au
T +61 2 9351 5383

Learning Outcomes

Students who graduate from Microbiology will be able to:

1. Explain core principles of microbiology identification, diversity, evolution and phylogeny
2. Articulate the defining principles of the various different major groups of microbes: the bacteria, archaea, fungi, protists and viruses
3. Understand the importance of microbes in our society and their roles in both harmful and helpful processes
4. Safely manipulate microbes in the laboratory and the demonstrate core skills of aseptic technique
5. Grow, enumerate and observe microbes macroscopically and microscopically.

Microbiology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MICROBIOLOGY			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Microbiology major			
A major in Microbiology requires 48 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units (iv) 24 credit points of 3000-level core units			
Microbiology minor			
A minor in Microbiology requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units (iv) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Selective			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
2000-level units of study			
Core			
MICR2031 **Microbiology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **N** MICR2021 or MICR2921 or MICR2024 or MICR2931	Semester 1
MICR2931 **Microbiology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **P** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2021 or MICR2921 or MICR2024 or MICR2031	Semester 1
MICR2022 **Microbes in Society**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **N** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
MICR2922 **Microbes in Society (Advanced)**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
MEDS2004 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream)..			
3000-level units of study			
Major core			
MICR3011 **Microbes in Infection**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **N** MICR3911 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
MICR3911 **Microbes in Infection (Advanced)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** MICR3011	Semester 1
MICR3032 **Cellular and Molecular Microbiology**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX) and MICR2X22] OR (BMED2401 and BMED2404) OR [12cp from (MICR2024 or MICR2X31 or GEGE2X01 or GENE2002)] **N** MICR3932 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3932 **Cellular and Molecular Microbiology (Adv)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in MICR2X22] OR [BMED2401 and BMED2404 and a mark of 75 or above in 6cp from (BMED2401 or BMED2404)] OR [6cp from (MICR2024 or MICR2X31) and a mark of 75 or above in 6cp from (GEGE2X01 or GENE2002)] **N** MICR3032 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3042 **Microbiology Research Skills**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX) and MICR2X22] OR (BMED2401 and BMED2404) OR [12cp from (MICR2024 or MICR2X31 or GEGE2X01 or GENE2002)] **N** MICR3942 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3942 **Microbiology Research Skills (Adv)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** 6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in MICR2X22] OR [BMED2401 and BMED2404 and a mark of 75 or above in 6cp from (BMED2401 or BMED2404)] OR [6cp from (MICR2024 or MICR2X31) and a mark of 75 or above in 6cp from (GEGE2X01 or GENE2002)] **N** MICR3022 or MICR3922 or MICR3042 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
VIRO3001 **Virology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3901 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
VIRO3901 **Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** VIRO3001 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
Minor core			
MICR3011 **Microbes in Infection**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **N** MICR3911 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
MICR3911 **Microbes in Infection (Advanced)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** MICR3011	Semester 1
MICR3032 **Cellular and Molecular Microbiology**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX) and MICR2X22] OR (BMED2401 and BMED2404) OR [12cp from (MICR2024 or MICR2X31 or GEGE2X01 or GENE2002)] **N** MICR3932 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3932 **Cellular and Molecular Microbiology (Adv)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in MICR2X22] OR [BMED2401 and BMED2404 and a mark of 75 or above in 6cp from (BMED2401 or BMED2404)] OR [6cp from (MICR2024 or MICR2X31) and a mark of 75 or above in 6cp from (GEGE2X01 or GENE2002)] **N** MICR3032 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Microbiology

MICROBIOLOGY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Microbiology major

A major in Microbiology requires 48 credit points from this table including:(i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units(iv) 24 credit points of 3000-level core units

Microbiology minor

A minor in Microbiology requires 36 credit points from this table including:(i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units(iv) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

Selective

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester *of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

2000-level units of study

Core

MICR2031
Microbiology

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2931 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45-minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: one written assignment (15%), one group oral presentation (10%) and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the earth's trees. This unit of study will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require if you specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology or science education.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

MICR2931
Microbiology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prerequisites:** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2021 or MICR2921 or

MICR2024 or MICR2031 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45 minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: two written assignments (10%, 15%), and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the Earth's trees. In this unit of study you will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Detailed aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require to specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology, or science education. As an Advanced unit, MICR2931 provides increased challenge and academic rigour to develop a greater understanding and depth of disciplinary expertise. You will actively participate in a series of small group tutorials investigating the molecular detail of microbial communication and function, which will culminate in you creating a scientific research report that communicates your understanding of recent research in microbiology.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

MICR2022
Microbes in Society

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials per semester. Eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **Prohibitions:** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, two assignments, one quiz, one practical exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

Pathogenic microbes cause infectious diseases of humans, animals and plants, and inflict enormous suffering and economic losses. Beneficial microbes are important contributors to food production, agriculture, biotechnology, and environmental processes. The aims of MICR2022/2922 are to explore the impacts and applications of microbes in human society and in the environment at large, and to teach skills and specialist knowledge in several key areas of microbiology. Medical Microbiology lectures will cover bacterial, viral, and fungal pathogens, and will introduce the concepts of epidemiology, transmission, pathogenicity, virulence factors, host/parasite relationships, host defences, prevention of disease, and antibiotic types, functions, and resistance. Lecture topics in other areas include Food (preservation, spoilage, poisoning, industrial context), Industrial (fermentation, traditional and recombinant products, bioprospecting), Environmental (nutrient cycles, atmosphere, wastewater, pollution, biodegradation) and Agricultural (nitrogen fixation, plant pathogens, biocontrol) microbiology. The laboratory sessions are integrated with the lecture series and are designed to give students practical experience in isolating, identifying and manipulating live potentially pathogenic microorganisms.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

MICR2922
Microbes in Society (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials, three 1-hour seminars and eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, one assignment, one quiz, one practical exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

This unit of study is based on MICR2022. A science communication exercise is unique to MICR2922 and consists of three small group sessions exploring how recent advances in microbiology are communicated to the wider public. This advanced component replaces one assignment exercise from the practical class and is assessed as short essay. The content and nature of this component is based on recent publications with potential high impact for society.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

BMED2404
Microbes, Infection and Immunity

Credit points: 6 **Teacher/Coordinator:** Dr Jim Manos **Session:** Semester 2 **Classes:** Two lectures and one practical per week, two tutorials **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), in-semester assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study begins by introducing the concepts of disease transmission, pathogenicity and virulence mechanisms of microbes. For a full understanding of the process of infection, the structure and function of pathogenic microorganisms is examined. How the body deals with injury and infection is discussed by exploring barriers to infection and host response once those barriers are breached. The body's response to such physical damage is dealt with in a series of lectures on wound healing, clotting and inflammation, and is complemented by discussion of the pharmacological basis of anti-inflammatory drugs. This is followed by a comprehensive discussion of molecular and cellular immune responses to pathogen invasion. In particular, this gives students an appreciation of the processing of antigens, the structure, production and diversity of antibodies, the operation of the complement system and mechanisms for recognition and destruction of invading microbes. The unit concludes with an overview of microbial diseases, the characteristics of causative agents, pathogenesis and symptoms as well as treatment and control and culminates with exploring current issues of antibiotic resistance, important emerging infections and vaccination strategies.

Practical classes illustrate and underpin the lecture content. Students will investigate normal flora, host defences and medically important microbes and will obtain experience in, and an understanding of, a range of techniques in bacteriology. In these practical sessions experience will be gained handling live, potentially pathogenic microbes.

Textbooks

Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016

Basic Immunology: Functions and Disorders of the Immune System. Abass AK and Lichtman AH WB Saunders, 4th Edition, 2013

Robbins Basic Pathology Kumar V, Abbas AK and Aster J Saunders, Philadelphia, 9th Edition, 2013

MEDS2004 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream)..

3000-level units of study

Major core

MICR3011
Microbes in Infection

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **Prohibitions:** MICR3911 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 2-hour exam; Practical (40%): case study: worksheet, lab work, presentation; one quiz; one 1-hour theory of prac exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The practical component is designed to enhance students' practical skills and to complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR et al. Medical Microbiology. 8th edition. Mosby. 2016.

MICR3911
Microbes in Infection (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week including six 1-hour tutorials, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester. **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** MICR3011 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1.5-hour exam (45%), one essay, one in-semester exam; Practical (40%): case study: worksheet, lab work, presentation; quiz; one 1-hour theory of prac exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is available to students who have performed well in Intermediate Microbiology. This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The unique aspect of this advanced unit that differentiates it from the mainstream unit is six tutorial style sessions that replace six mainstream lectures in the theme 'Emerging and re-emerging diseases'. These dedicated research-led interactive advanced sessions support self-directed learning and involve discussion around specific topics that will vary from year to year. Nominated research papers and reviews in the topic area will be explored with supported discussion of the relevance to and impact of the work on current thinking around emergence of microbial disease. The focus will be on microbial change that lies critically at the centre of understanding the reasons for the emergence of new diseases and challenges in an era of significant scientific ability to diagnose and treat infection. The practical component is identical to the mainstream unit and is designed to enhance students' practical skills and to complement the lectures. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR.et al. Medical Microbiology. 8th ed., Mosby, 2016

MICR3032
Cellular and Molecular Microbiology

Credit points: 6 **Teacher/Coordinator:** Dr Nick Coleman **Session:** Semester 2 **Classes:** Three lectures per week and one 2-hour practical or tutorial per week **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and MICR2X22] OR (BMED2401 and BMED2404) OR [12cp from (MICR2024 or MICR2X31 or GEGE2X01 or GENE2002)] **Prohibitions:** MICR3932 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1-hour exam (mid semester); one 2-hour exam (end of semester); Prac (40%): One 2-hour exam (open book, mid-semester), one oral presentation (end of semester); one in-prac bioinformatics assessment task, one 1.5 hr bioinformatics prac exam (end of semester) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This Unit of Study introduces students to key concepts in cellular and molecular microbiology. Building on knowledge gained in MICR2021 and MICR2022, as well as MBLG1001, the lectures explore areas of microbial evolution, pathogenesis, physiology, ecology, biotechnology and genetics, with each key theme explored with a series of 6 lectures led by an expert in the field. Lectures will be complemented with practical/tutorial sessions that explore recent research in these areas. The first set of practical/tutorial sessions are small-group sessions led by demonstrators, that are focused on critical interpretation of the scientific literature in the area of host-microbe interactions. The focus is on experimental design, and analysis of the raw data. The second set of pracs are bioinformatics labs, which introduce software such as ORF Finder, BLAST, ClustalX, and TreeView and databases such as NCBI-Nucleotide and KEGG; the aim is to figure out the identity, functions, and biotechnological applications of a mystery piece of microbial DNA. It is recommended that students also take the complementary unit of study MICR3042 or MICR3942.

MICR3932
Cellular and Molecular Microbiology (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Nick Coleman **Session:** Semester 2 **Classes:** Three lectures per week and one 2-hour prac/tute per week **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in MICR2X22] OR [BMED2401 and BMED2404 and a mark of 75 or above in 6cp from (BMED2401 or BMED2404)] OR [6cp from (MICR2024 or MICR2X31) and a mark of 75 or above in 6cp from (GEGE2X01 or GENE2002)] **Prohibitions:** MICR3032 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1-hour theory exam (mid semester); one 2-hour exam (end of semester); Prac (40%): one written assessment task, assessment of website. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study introduces students to key concepts in cellular and molecular microbiology. Building on knowledge gained in MICR2021 and MICR2022, as well as MBLG1001, the lectures explore areas of microbial evolution, pathogenesis, physiology, ecology, biotechnology and genetics, with each key theme explored with a series of 6 lectures led by an expert in the field.The first set of practical/tutorial sessions are small-group sessions led by an academic, which are focused on critical interpretation of the scientific literature in the area of host-microbe interactions. The focus is on evaluating the scientific significance of published papers, and determining the level of experimental support for key conclusions. The second set of prac sessions teaches the creative presentation of science to both fellow scientists and the public by designing a website around an area of interest in microbiology. It is recommended that students also take the complementary unit of study, MICR3042 or MICR3942.

Textbooks

None

MICR3042
Microbiology Research Skills

Credit points: 6 **Teacher/Coordinator:** Prof Dee Carter **Session:** Semester 2 **Classes:** Two lectures per week from week 1-7, one 4-hour practical per week. **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and MICR2X22] OR (BMED2401 and BMED2404) OR [12cp from (MICR2024 or MICR2X31 or GEGE2X01 or GENE2002)] **Prohibitions:** MICR3942 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** One 1-hour theory exam (40%). Two 40-min theory of prac exams, in-lab continuous assessment, two prac reports, one short video presentation (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Research in molecular microbiology is needed to tackle problems in medicine, agriculture, environmental science, and biotechnology. This Unit of Study focuses on developing practical skills and training in experimental approaches and that are essential for laboratory research in molecular microbiology, together with knowledge of the underlying theoretical concepts. We will focus on key areas of modern microbiology including Bioremediation, where micro-organisms are used to break down harmful substrates in the environment; Microbial biotechnology, which explores how microbes can be used as cellular factories to produce useful products; Medical microbiology, where molecular epidemiology is used to track a disease outbreak, and Yeast genetics, where we explore genes and protein interaction networks that cells regulate in their response to antibiotic agents. It is strongly recommended that students also take the complementary unit of study MICR3032 or MICR3932.

MICR3942
Microbiology Research Skills (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Dee Carter **Session:** Semester 2 **Classes:** Two lectures per week from Week 1Â¿7. Project work equivalent to 4 hours per week. **Prerequisites:** 6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in MICR2X22] OR [BMED2401 and BMED2404 and a mark of 75 or above in 6cp from (BMED2401 or BMED2404)] OR [6cp from (MICR2024 or MICR2X31) and a mark of 75 or above in 6cp from (GEGE2X01 or GENE2002)] **Prohibitions:** MICR3022 or MICR3922 or MICR3042 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** One 1-hour theory exam (40%). Two reports, presentation of research via short video, supervisor mark based on performance in research project (60%) **Practical field work:** Research project in an academic microbiology lab, 48 hours total, at times decided between student and supervisor. Research projects will be announced at the start of semester. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Research in molecular microbiology is needed to tackle problems in medicine, agriculture, environmental science, and biotechnology. This Unit of Study focuses on developing practical skills and training in experimental approaches that are essential for laboratory research in molecular microbiology, together with knowledge of the underlying theoretical concepts. In this Unit the practical component is entirely replaced by a research project undertaken in an academic microbiology lab. The lecture material in MICR3942 focuses on the areas of microbial biotechnology and bioremediation, and the genetic and molecular diversity of medically important eukaryotic microbes. It is strongly recommended that students also take the complementary unit of study, MICR3032 or MICR3932.

VIRO3001
Virology

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 26 1-hour lectures, seven 4-hour practical classes, one 2-hour tutorial **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3901 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam (60%) (120 minutes). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novel vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluorescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Tutorials cover a range of topical issues and provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3901
Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 29 1-hour lectures, seven 4-hour practical classes, four 1-hour tutorials **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** VIRO3001 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), individual presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam: (60%) (120 minutes) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Intermediate Microbiology and is based on VIRO3001 with additional lectures related to the research interests in the Discipline. Consequently, the unit of study content may change from year to year. Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novle vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluroescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Advanced lectures cover cutting-edge research in the field of virology in small group discussions and presentations that provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

Minor core

MICR3011
Microbes in Infection

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **Prohibitions:** MICR3911 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 2-hour exam; Practical (40%): case study: worksheet, lab work, presentation; one quiz; one 1-hour theory of prac exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The practical component is designed to enhance students' practical skills and to complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR et al. Medical Microbiology. 8th edition. Mosby. 2016.

MICR3911
Microbes in Infection (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week including six 1-hour tutorials, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester. **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** MICR3011 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1.5-hour exam (45%), one essay, one in-semester exam; Practical (40%): case study: worksheet, lab work, presentation; quiz; one 1-hour theory of prac exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is available to students who have performed well in Intermediate Microbiology. This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The unique aspect of this advanced unit that differentiates it from the mainstream unit is six tutorial style sessions that replace six mainstream lectures in the theme 'Emerging and re-emerging diseases'. These dedicated research-led interactive advanced sessions support self-directed learning and involve discussion around specific topics that will vary from year to year. Nominated research papers and reviews in the topic area will be explored with supported discussion of the relevance to and impact of the work on current thinking around emergence of microbial disease. The focus will be on microbial change that lies critically at the centre of understanding the reasons for the emergence of new diseases and challenges in an era of significant scientific ability to diagnose and treat infection. The practical component is identical to the mainstream unit and is designed to enhance students' practical skills and to complement the lectures. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR.et al. Medical Microbiology. 8th ed., Mosby, 2016

MICR3032
Cellular and Molecular Microbiology

Credit points: 6 **Teacher/Coordinator:** Dr Nick Coleman **Session:** Semester 2 **Classes:** Three lectures per week and one 2-hour practical or tutorial per week **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and MICR2X22] OR (BMED2401 and BMED2404) OR [12cp from (MICR2024 or MICR2X31 or GEGE2X01 or GENE2002)] **Prohibitions:** MICR3932 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1-hour exam (mid semester); one 2-hour exam (end of semester); Prac (40%): One 2-hour exam (open book, mid-semester), one oral presentation (end of semester); one in-prac bioinformatics assessment task, one 1.5 hr bioinformatics prac exam (end of semester) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This Unit of Study introduces students to key concepts in cellular and molecular microbiology. Building on knowledge gained in MICR2021 and MICR2022, as well as MBLG1001, the lectures explore areas of microbial evolution, pathogenesis, physiology, ecology, biotechnology and genetics, with each key theme explored with a series of 6 lectures led by an expert in the field. Lectures will be complemented with practical/tutorial sessions that explore recent research in these areas. The first set of practical/tutorial sessions are small-group sessions led by demonstrators, that are focused on critical interpretation of the scientific literature in the area of host-microbe interactions. The focus is on experimental design, and analysis of the raw data. The second set of pracs are bioinformatics labs, which introduce software such as ORF Finder, BLAST, ClustalX, and TreeView and databases such as NCBI-Nucleotide and KEGG; the aim is to figure out the identity, functions, and biotechnological applications of a mystery piece of microbial DNA. It is recommended that students also take the complementary unit of study MICR3042 or MICR3942.

MICR3932
Cellular and Molecular Microbiology (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Nick Coleman **Session:** Semester 2 **Classes:** Three lectures per week and one 2-hour prac/tute per week **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in MICR2X22] OR [BMED2401 and BMED2404 and a mark of 75 or above in 6cp from (BMED2401 or BMED2404)] OR [6cp from (MICR2024 or MICR2X31) and a mark of 75 or above in 6cp from (GEGE2X01 or GENE2002)] **Prohibitions:** MICR3032 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1-hour theory exam (mid semester); one 2-hour exam (end of semester); Prac (40%): one written assessment task, assessment of website. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study introduces students to key concepts in cellular and molecular microbiology. Building on knowledge gained in MICR2021 and MICR2022, as well as MBLG1001, the lectures explore areas of microbial evolution, pathogenesis, physiology, ecology, biotechnology and genetics, with each key theme explored with a series of 6 lectures led by an expert in the field.The first set of practical/tutorial sessions are small-group sessions led by an academic, which are focused on critical interpretation of the scientific literature in the area of host-microbe interactions. The focus is on evaluating the scientific significance of published papers, and determining the level of experimental support for key conclusions. The second set of prac sessions teaches the creative presentation of science to both fellow scientists and the public by designing a website around an area of interest in microbiology. It is recommended that students also take the complementary unit of study, MICR3042 or MICR3942.

Textbooks
None

Nanoscience and Nanotechnology

Nanoscience and Technology is an interdisciplinary program offered by the School of Chemistry and the School of Physics in the Faculty of Science and the Faculty of Engineering and Information Technologies. Units of study in this program are available at Normal and Advanced level.

About the program

A program in Nanoscience and Nanotechnology draws on the strengths of all the basic sciences, including chemistry, physics, maths and life sciences, and will demonstrate how this disciplinary knowledge can be translated into technological applications in materials science and engineering. This reflects the highly interdisciplinary nature of nanoscience and nanotechnology and is highly recommended for anyone wishing to undertake a research project with the Australian Institute for Nanoscale Science and Technology.

Nanoscience and Technology is designed for students interested in understanding the emerging science of working and building at and near the molecular level. It incorporates study of the fundamental sciences in order to understand the structure of matter, as well as technological elements of the mechanical properties of materials. Students undertaking this program are strongly encouraged to take suitable units from the Faculty of Engineering in combination with physics and chemistry.

A student seeking to complete this program should study physics and/or chemistry and/or engineering in their 1000-level and 2000-level years together with some mathematics. In the 3000-level year it is possible to focus on two of the three discipline areas, or to continue studying elements of all three. This program may also be seen as a complement to a traditional major in chemistry or physics. Refer to Table A for an enrolment guide. Engineering units are described in the engineering handbook.

Requirements for completion

The Nanoscience and Nanotechnology program requires 108 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)12 credit points of 4000-level core units
(iv)12 credit points of 4000-level selective units
(v)12 credit points of 4000-level project units
(vi)A 48 credit point major in Chemistry or Physics

First year

Core for Program: MATH1021/1921/1931, MATH1023/1923/1933, MATH1002/1902 and MATH1005/1905

Students also complete units towards a Chemistry or Physics major:
Core for Chemistry major: 12 credit points of 1000-level Chemistry
Core for Physics major: 12 credit points of 1000-level Physics

Note: Recommended second majors include physics, or chemistry, or a Table S major in one of the fifteen available Engineering majors: e.g. materials, electrical, chemical & biomolecular, environmental, mechanical, power, telecommunications.

Second year

Core for Program: MATH2021/2921 and NANO2002

Third year

Students complete units towards their Major 1 and Major 2 and/or electives. Students must take at least one designated project unit counting towards each major.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework

The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000 level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Nanoscience and Nanotechnology: completion of 24 credit points of project work and 24 credit points of coursework.

Note: Honours with 24cp Project and 24cp 4000-level coursework would require Major 2 to be completed within 3 years.

NANO4001, NANO4002, NANO4003, NANO4004 and 12 credit points from a selection of: AMME4XX1, AMME4XX2, AMME4XX3, CHNG4XXX, ELEC4XXX, PHYS4XXX.

Honours units of study will be available in 2020.

Contact and further information

The Australian Institute for Nanoscale Science and Technology
E AINST.admin@sydney.edu.au
T +61 2 9036 9050

Associate Professor Chiara Neto
E chiara.neto@sydney.edu.au
T +61 2 9351 2752

Learning Outcomes

Students who graduate from Nanoscience and Nanotechnology will be able to:

1. Gain a comprehensive understanding, in both depth and breadth, of nano-scale phenomena and be able to explain, with a few key examples, how and why properties of materials and systems at the nano-scale differ from those on ordinary, macro (and even micro) scales
2. Describe in depth one or two examples of nanotechnologies used in industry
3. Develop an appreciation of the importance of integrating knowledge and skills from multiple discipline bases
4. Gain a basic understanding of top-down nanofabrication and relevant lithographic techniques and capabilities
5. Gain a basic understanding of bottom-up synthesis and self-assembly techniques and capabilities
6. Gain skills in nanoscale characterization techniques and capabilities such as electron microscopy and atomic force microscopy.

Nanoscience and Nanotechnology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
NANOSCIENCE AND NANOTECHNOLOGY			
Nanoscience and Nanotechnology program			
A program in Nanoscience and Nanotechnology requires 108 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 4000-level core units (iv) 12 credit points of 4000-level selective units (v) 12 credit points of 4000-level project units (vi) A 48 credit point major in Chemistry or Physics			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
MATH1021 **Calculus Of One Variable**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931	Semester 1
MATH1921 **Calculus Of One Variable (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 *Note: Department permission required for enrolment*	Semester 1
MATH1931 **Calculus Of One Variable (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 1
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1012 or MATH1014 or MATH1902	Semester 1 Summer Main
MATH1902 **Linear Algebra (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1002 or MATH1012 or MATH1014 *Note: Department permission required for enrolment*	Semester 1
MATH1023 **Multivariable Calculus and Modelling**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933	Semester 2
MATH1923 **Multivariable Calculus and Modelling (Adv)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 *Note: Department permission required for enrolment*	Semester 2
MATH1933 **Multivariable Calculus and Modelling (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 2
MATH1005 **Statistical Thinking with Data**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020	Semester 2 Summer Main Winter Main
MATH1905 **Statistical Thinking with Data (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
MATH2021 **Vector Calculus and Differential Equations**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1XX2) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) **N** MATH2921 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
MATH2921 **Vector Calculus and Differential Eqs (Adv)**	6	**P** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **N** MATH2021 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067	Semester 1
NANO2XXX to be developed for offering in 2019.			
4000-level units of study			
Core			
NANO4001 and NANO4002 to be developed for offering in 2019.			
Project units			
NANO4003 and NANO4004 to be developed for offering in 2019.			
Selective			
AMME4XX1, AMME4XX2, AMME4XX3, CHNG4XXX, ELEC4XXXX and PHYS4XXX to be developed for offering in 2020.			

Nanoscience and Nanotechnology

NANOSCIENCE AND NANOTECHNOLOGY

Nanoscience and Nanotechnology program

A program in Nanoscience and Nanotechnology requires 108 credit points from this table including: (i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 12 credit points of 4000-level core units (iv) 12 credit points of 4000-level selective units(v) 12 credit points of 4000-level project units(vi) A 48 credit point major in Chemistry or Physics

Units of study

The units of study are listed below.

1000-level units of study

Core

MATH1021
Calculus Of One Variable

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals.

Textbooks
As set out in the Junior Mathematics Handbook.

MATH1921
Calculus Of One Variable (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals. Additional theoretical topics included in this advanced unit include the Intermediate Value Theorem, Rolle's Theorem, and the Mean Value Theorem.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1931
Calculus Of One Variable (SSP)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1921 Calculus of One Variable (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

MATH1002
Linear Algebra

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1014 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1002 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study introduces vectors and vector algebra, linear algebra including solutions of linear systems, matrices, determinants, eigenvalues and eigenvectors.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1902
Linear Algebra (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1002 or MATH1012 or MATH1014 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. It parallels the normal unit MATH1002 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1023
Multivariable Calculus and Modelling

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1923
Multivariable Calculus and Modelling (Adv)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable. Additional topics covered in this advanced unit of study include the use of diagonalisation of matrices to study systems of linear equation and optimisation problems, limits of functions of two or more variables, and the derivative of a function of two or more variables.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1933
Multivariable Calculus and Modelling (SSP)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1923 Multivariable Calculus and Modelling (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

MATH1005
Statistical Thinking with Data

Credit points: 3 **Session:** Semester 2, Summer Main, Winter Main **Classes:** Lectures 2 hrs/week; Practical 1 hr/week **Prohibitions:** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In a data-rich world, global citizens need to problem solve with data, and evidence based decision-making is essential is every field of research and work.

This unit equips you with the foundational statistical thinking to become a critical consumer of data. You will learn to think analytically about data and to evaluate the validity and accuracy of any conclusions drawn. Focusing on statistical literacy, the unit covers foundational statistical concepts, including the design of experiments, exploratory data analysis, sampling and tests of significance.

Textbooks
Freedman, Pisani and Purves, Statistics, Norton, 2007

MATH1905
Statistical Thinking with Data (Advanced)

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. This Advanced level unit of study parallels the normal unit MATH1005 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks
As set out in the Junior Mathematics Handbook

2000-level units of study

Core

MATH2021
Vector Calculus and Differential Equations

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1XX2) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) **Prohibitions:** MATH2921 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067 **Assessment:** assessment for this unit consists of quizzes, assignments, and a final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit opens with topics from vector calculus, including vector-valued functions (parametrised curves and surfaces; vector fields; div, grad and curl; gradient fields and potential functions), line integrals (arc length; work; path-independent integrals and conservative fields; flux across a curve), iterated integrals (double and triple integrals, polar, cylindrical and spherical coordinates; areas, volumes and mass; Green's Theorem), flux integrals (flow through a surface; flux integrals through a surface defined by a function of two variables, through cylinders, spheres and other parametrised surfaces), Gauss' and Stokes' theorems. The unit then moves to topics in solution techniques for ordinary and partial differential equations (ODEs and PDEs) with applications. It provides a basic grounding in these techniques to enable students to build on the concepts in their subsequent courses. The main topics are: second order ODEs (including inhomogeneous equations), higher order ODEs and systems of first order equations, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series).

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2921
Vector Calculus and Differential Eqs (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **Prohibitions:** MATH2021 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067 **Assessment:** assessment for this unit consists of quizzes, assignments, and a final exam. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the advanced version of MATH2021, with more emphasis on the underlying concepts and mathematical rigour. The vector calculus component of the course will include: parametrised curves and surfaces, vector fields, div, grad and curl, gradient fields and potential functions, lagrange multipliers line integrals, arc length, work, path-independent integrals, and conservative fields, flux across a curve, double and triple integrals, change of variable formulas, polar, cylindrical and spherical coordinates, areas, volumes and mass, flux integrals, and Green's Gauss' and Stokes' theorems. The Differential Equations half of the course will focus on ordinary and partial differential equations (ODEs and PDEs) with applications with more complexity and depth. The main topics are: second order ODEs (including inhomogeneous equations), series solutions near a regular point, higher order ODEs and systems of first order equations, matrix equations and solutions, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, elementary Sturm-Liouville theory, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series). The unit then moves to topics in solution techniques for ordinary and partial differential equations (ODEs and PDEs) with applications. It provides a more thorough grounding in these techniques to enable students to build on the concepts in their subsequent courses. The main topics are: second order ODEs (including inhomogeneous equations), higher order ODEs and systems of first order equations, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series).

Textbooks

As set out in the Intermediate Mathematics Handbook

NANO2XXX to be developed for offering in 2019.

4000-level units of study

Core

NANO4001 and NANO4002 to be developed for offering in 2019.

Project units

NANO4003 and NANO4004 to be developed for offering in 2019.

Selective

AMME4XX1, AMME4XX2, AMME4XX3, CHNG4XXX, ELEC4XXXX and PHYS4XXX to be developed for offering in 2020.

Neuroscience

Neuroscience is an interdisciplinary major offered by the School of Medical Sciences and the School of Psychology. Units of study in this major are available at standard and advanced level.

About the major

Study of the brain and nervous system is one of the largest and fastest growing endeavors of the biological sciences. Neuroscience is recognised as a discipline in its own right and a hallmark of the discipline is its acknowledgement of its multidisciplinary history.

The program and major comprise units of study from the School of Psychology and the School of Medical Sciences (Anatomy and Histology; Physiology and Pharmacology). Neuroscience is identified as one of the research strengths of the University. The neurosciences are both taught and actively researched at multiple locations in the University and this program and major offers a pivot around which students can navigate this particular research strength.

The program is offered in an expanding area of global research activity, and in a subject which is already enjoying translation in a number of areas, for example in the fields of engineering, computation, economics and business.

Requirements for completion

A program in Neuroscience requires 60 credit points, consisting of:

(i)12 credit points of 2000-level core units
(ii)A major in Neuroscience

A major in Neuroscience requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)24 credit points of 3000-level core units

A minor in Neuroscience is available and articulates to this major.

First year

Core to major: CHEM1XX1, PSYC1002

The program in Neuroscience begins in first year with an introduction to psychology and an introduction to chemistry, each provides key foundational knowledge in understanding brain structure and function.

Second year

Core to major: PSYC2X10, ANAT2X10 (students enrolled in the Medical Science stream take MEDS2005).
Core to program: PCOL2011, PHSI2X05.

The program in Neuroscience continues in second year with units that focus on the structure and organisation of the central nervous system, the physiological actions of its component cells, their neurochemistry and functional relations. We consider also the behavioural and cognitive processes that are possible through these different levels of functional organisation.

Third year

The third year units in the program provide greater breadth and depth in understanding brain structure and function:

Core: NEUR3X05, NEUR3X06, PCOL3X22, PSYC3X14.

These units focus on:
(i)gaining advanced understanding of functional neuroanatomy and systems neuroscience, through a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities.
(ii)understanding the mechanisms that drive neurons and neural circuits throughout the brain and body.
(iii)understanding the neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases, together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia; and
(iv)considering the approaches to studying neurosciences specifically about molecular, pre-clinical and clinical models of brain function.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000 level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Neuroscience: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

Address:
School of Medical Sciences
Anderson Stuart Building F13
University of Sydney NSW 2006

School of Psychology
Griffith Taylor Building (A19)
University of Sydney NSW 2006

E yvonne.smythe@sydney.edu.au
T +61 2 9351 2841

Dr Karen Cullen
E Karen.Cullen@sydney.edu.au
T +61 2 9351 2696
W sydney.edu.au/medicine/anatomy/

Honours Contact:
Associate Professor Kevin Keay
T +61 2 9351 4132
E keay@anatomy.usyd.edu.au

Learning Outcomes

Students who graduate from Neuroscience will be able to:

1. Demonstrate a deep understanding the fundamental organization of the brain and nervous system from its gross structure to the intracellular and molecular levels.
2. Demonstrate a deep understanding the fundamental functional properties of molecular, intracellular, cellular, circuit and systems components of the brain and nervous system.
3. Relate the structural organization and functional properties of the nervous system to the observable processes of behaviour and cognition.
4. Search, identify, discuss and evaluate the primary scientific literature in the field of the neurosciences.
5. Specify hypotheses, design research plans and specify experiments that address and test the hypotheses. Understand the methodology of the neuroscientist in the past, the present, the state-of-the-art and to discuss the aspirations of the future.
6. Analyse, illustrate, describe, and present primary research data.
7. Work autonomously and independently, work in small groups, work in seminar groups, lead discussion and assume responsibility for teaching and learning.
8. Communicate clearly and effectively. Communicate in written form for specialist, generalist and lay audiences. Communicate in oral form for specialist, generalist and lay audiences. Experience communicating the neurosciences through other forms of multi-media, ie., film, video, photography, 3-D media and printing.
9. Understand the place of neurosciences in community and society, its medical, educational, social and global importance, its power and potential, its uses and possible abuses.

Neuroscience

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session

NEUROSCIENCE

Advanced coursework and projects will be available in 2020 for students who complete this major.

Neuroscience program

A program in Neuroscience requires 60 credit points from this table including:

(i) 12 credit points of 2000-level core units

(ii) A major in Neuroscience

Neuroscience major

A major in Neuroscience requires 48 credit points from this table including:

(i) 12 credit points of 1000-level core units

(ii) 12 credit points of 2000-level core units

(iii) 24 credit points of 3000-level core units

Neuroscience minor

A minor in Neuroscience requires 36 credit points from this table including:

(i) 12 credit points of 1000-level core units

(ii) 12 credit points of 2000-level core units

(iii) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
PSYC1002 **Psychology 1002**	6	*This unit is also offered in the Sydney Summer School. For more information consult the web site: http://sydney.edu.au/summer/*	Semester 2 Summer Main

2000-level units of study

Program core

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PCOL2011 **Pharmacology Fundamentals**	6	**A** BIOL1XXX or MBLG1XX1 **P** 6cp from CHEM1XXX **N** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PHSI2005 **Integrated Physiology A**	6	**P** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PHSI2905 **Integrated Physiology A (Advanced)**	6	**P** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
Major and minor core			
PSYC2010 **Brain and Behaviour**	6	**P** PSYC1002 **N** PSYC2011, PSYC2911, PSYC2910	Semester 1
PSYC2910 **Brain and Behaviour (Advanced)**	6	**P** A mark of at least 75 in PSYC1002 **N** PSYC2011, PSYC2911, PSYC2010	Semester 1
ANAT2010 **Concepts of Neuroanatomy**	6	**A** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **N** ANAT2910 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 2
ANAT2910 **Concepts in Neuroanatomy Adv**	6	**A** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **P** Annual average mark of at least 70 in previous year **N** ANAT2010 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *Note: Department permission required for enrolment*	Semester 2
MEDS2005 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Major core			
NEUR3005 **Functional Neuroanatomy**	6	**A** [ANAT2010 or ANAT2910 or (BMED2401 and 12 additional credit points of BMED2402, BMED2403, BMED2405, BMED2406) **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3905 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3905 **Functional Neuroanatomy (Advanced)**	6	**A** [ANAT2010 or ANAT2910) or (BMED2401 and 12 additional credit points of BMED240X) **P** Annual average mark of 70 or above in the previous year **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3005 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3006 **Neural Information Processing**	6	**P** PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X) **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3906 **Neural Information Processing (Advanced)**	6	**P** A mark of 75 or above in [PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X)] **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3006 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PCOL3022 **Neuropharmacology**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **N** PCOL3922	Semester 2
PCOL3922 **Neuropharmacology (Advanced)**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **P** An annual average mark of 70 or above in the previous year **N** PCOL3022	Semester 2
PSYC3014 **Behavioural and Cognitive Neuroscience**	6	**P** [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **N** PSYC3914	Semester 2
PSYC3914 **Behavioural and Cognitive Neuroscience Adv**	6	**P** [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **N** PSYC3014	Semester 2
Minor core			
NEUR3005 **Functional Neuroanatomy**	6	**A** [ANAT2010 or ANAT2910 or (BMED2401 and 12 additional credit points of BMED2402, BMED2403, BMED2405, BMED2406) **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3905 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3905 **Functional Neuroanatomy (Advanced)**	6	**A** [ANAT2010 or ANAT2910) or (BMED2401 and 12 additional credit points of BMED240X) **P** Annual average mark of 70 or above in the previous year **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3005 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PSYC3014 **Behavioural and Cognitive Neuroscience**	6	**P** [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **N** PSYC3914	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PSYC3914 **Behavioural and Cognitive Neuroscience Adv**	6	**P** [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **N** PSYC3014	Semester 2

Neuroscience

NEUROSCIENCE

Advanced coursework and projects will be available in 2020 for students who complete this major.

Neuroscience program

A program in Neuroscience requires 60 credit points from this table including: (i) 12 credit points of 2000-level core units(ii) A major in Neuroscience

Neuroscience major

A major in Neuroscience requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 24 credit points of 3000-level core units

Neuroscience minor

A minor in Neuroscience requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

PSYC1002
Psychology 1002

Credit points: 6 **Session:** Semester 2, Summer Main **Classes:** Three 1 hour lectures and one 1 hour tutorial per week, plus 1 hour per week of additional web-based (self-paced) material related to the tutorial. **Assessment:** One 2.5hr exam, one 1000 word research report, multiple tutorial tests, experimental participation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is also offered in the Sydney Summer School. For more information consult the web site: http://sydney.edu.au/summer/

Psychology 1002 is a further general introduction to the main topics and methods of psychology, and it is the basis for advanced work as well as being of use to those not proceeding with the subject. Psychology 1002 covers the following areas: neuroscience; human mental abilities; learning and motivation; visual perception; cognitive processes; abnormal psychology.

This unit is also offered in the Sydney Summer School. For more information consult the web site:

http://sydney.edu.au/summer_school/

Textbooks
Available on-line once semester commences

2000-level units of study

Program core

PCOL2011
Pharmacology Fundamentals

Credit points: 6 **Teacher/Coordinator:** Dr Hilary Lloyd **Session:** Semester 1 **Classes:** Lectures (2 x1 hr per week); wet and dry labs (5 x4 hrs), data anaylsis tutorials (2 x 2 hrs); workshops (6 x 2 hrs) **Prerequisites:** 6cp from CHEM1XXX **Prohibitions:** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XXX or MBLG1XX1 **Assessment:** In-semester (40%), which consists of 4 x on-line quizzes, 2 x lab reports, 3 x research topics, 1 x oral presentation, end-of-semester examination (60%), which consists of multiple choice and short answer questions **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides the fundamental grounding in four basic areas in Pharmacology: (1) principles of drug action (2) pharmacokinetics and drug metabolism (3) experimental design and autonomic pharmacology, and (4) drug design. The delivery of material involves lectures, practicals, computer-aided learning and problem-based workshops. Practical classes provide students with the opportunity of acquiring technical experience and teamwork skills. Problem-based workshops are based on real-life scenarios of drug use in the community. These workshops require students to integrate information obtained in lectures in order to provide solutions to the problems. Online quizzes accompany each module and are to encourage continued learning throughout the semester.

Textbooks
Rang and Dale's Pharmacology, 8th Edition. H. P. Rang, J. M. Ritter, R. J. Flower, and G. Henderson, (Elsevier 2016). Medical Pharmacology at a Glance, 7th edn M.J. Neal: (Blackwell Scientific Publications, 2012).

PHSI2005
Integrated Physiology A

Credit points: 6 **Teacher/Coordinator:** Dr Michael Morris **Session:** Semester 1 **Classes:** Three 1 hour lectures per week. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual written assessments, and quizzes (100%) **Practical field work:** One 3 hour practical or one 3 hour tutorial per week. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study offers an introduction to the basic concepts underpinning physiology, excitable cell (nerve and muscle) physiology, as well as the functions of the nervous system (central processing, and sensory and motor systems). It also incorporates cardiovascular and exercise physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Tutorial sessions develop critical thinking, the integrative nature of physiology, and generic skills in scientific writing and presentation. The practicals and tutorials also emphasise group learning and team work.

Textbooks
Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 7th edition. 2015. ISBN-10: 0321981227; ISBN-13: 978-0321981226 (International Edition)

PHSI2905
Integrated Physiology A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 1 **Classes:** Five 1 hour lectures, one 3 hour practical and one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated

Advanced Practical and Tutorial sessions. Students will also be exempt from all Inquiry-based learning tutorials. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2005 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2005. This unit of study offers a basic introduction to the functions of the nervous system, excitable cell (nerve and muscle) physiology, sensory and motor systems, and central processing. It also incorporates haematology and cardiovascular physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Inquiry-based learning sessions develop critical thinking and generic skills while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2010. ISBN 10:0-321-1750071; ISBN 13:978-0-321-750075 (International Edition).

Major and minor core

PSYC2010
Brain and Behaviour

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2910 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study examines a range of phenomena and principles in behaviour, learning and perception, abnormal psychology and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes are designed for students with an interest in clinical and therapeutic Psychology, and will allow students to design and implement a behaviour modification programme.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.
Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2910
Brain and Behaviour (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Ian Johnston **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** A mark of at least 75 in PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2010 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study focuses on the Behavioural Sciences, Neurosciences, Abnormal Psychology and the study of perception. The lecture content is the same as PSYC2011, and examines a range of phenomena and principles in behaviour, learning and perception, and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes differ from PSYC2011, as it is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. Students will gain hands-on laboratory experience in how the principles and phenomena of behavioural neuroscience may be studied experimentally.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.
Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

ANAT2010
Concepts of Neuroanatomy

Credit points: 6 **Teacher/Coordinator:** Dr Karen Cullen **Session:** Semester 2 **Classes:** two 1-hour lectures per week **Prohibitions:** ANAT2910 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **Assessment:** One theory exam, one practical exam, one mid-semester in-class quiz, periodic online quizzes and written poster presentation **Practical field work:** Tutorials: One 2-hour practical tutorial in 5 sessions during semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students are introduced to the structure and organisation of the central and peripheral nervous system. The course begins with an exploration into the make-up of the individual cells, followed by an examination of the different regions of the nervous system. A final theme of the course touches on the organisation of sensory, motor and integrative systems, together with aspects of higher-order function such as memory and language. The subject covers general concepts of organisation, structure and function of the brain. Tutorial meetings will provide the opportunity to encounter topics in functional anatomy and histology of the brain using photographs, diagrams, models, animations and problem-solving. Topics in identification of central nervous system structure in typical magnetic resonance images will assist in reinforcing the theory of functional anatomy in a format students are likely to encounter in further study and in real-world situations and readings. This course will be of considerable interest to students studying anatomy and related disciplines, as well as those wishing to pursue further study in Neuroscience at senior levels.

Textbooks

Bear, MF, Connors, BW, Paradiso, MA. Neuroscience: Exploring the Brain. 3rd edition. Williams and Wilkins. 2006. Also recommended: Nolte J, Angevine JJB. The Human Brain in Photographs and Diagrams. Mosby/Elsevier. 2007.

ANAT2910
Concepts in Neuroanatomy Adv

Credit points: 6 **Teacher/Coordinator:** Dr Karen Cullen **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 1 x 1hr tutorial **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** ANAT2010 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **Assessment:** one 2-hour theory exam, one 45 min practical exam, one 1200 word critical scientific review article, one mid-semester quiz, three short online quiz-style assignments **Practical field work:** 1 x 1 hr practical **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Students are introduced to the structure and organisation of the central and peripheral nervous system. The course begins with an exploration into the make-up of the individual cells, followed by an examination of the different regions of the nervous system. A final theme of the course touches on the organisation of various systems (sensory and motor), together with aspects of higher-order function such as memory and language. In essence, the subject covers general concepts of organisation, structure and function of the brain. The laboratory practical sessions offer students the special privilege to examine human specimens in the Anatomy labs and museum. Tutorial meetings will provide the opportunity to encounter topics in functional anatomy and histology of the brain using photographs, diagrams, models, animations and problem-solving. Topics in identification of central nervous system structure in typical magnetic resonance images will assist in reinforcing the theory of functional anatomy in a format students are likely to encounter in further study and in real-world situations and readings. This course will be of considerable interest to students studying anatomy and related disciplines, as well as those wishing to pursue further study in Neuroscience at senior levels.

Textbooks

Required text: Bear, M.F., B.W. Connors, M.A. Paradiso. Neuroscience. Exploring the Brain (4th edition) Wolters Kluwer, 2016. Recommended Atlas: Nolte and Angevine. The human brain in photographs and diagrams. 4th edition Philadelphia: Elsevier/Saunders, 2013.

MEDS2005 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Major core

NEUR3005
Functional Neuroanatomy

Credit points: 6 **Teacher/Coordinator:** Dr Paul Austin **Session:** Semester 1 **Classes:** Two one-hour lectures per week, one guest leacture, 3 two-hour seminars **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3905 **Assumed knowledge:** [ANAT2010 or ANAT2910 or (BMED2401 and 12 additional credit points of BMED2402, BMED2403, BMED2405, BMED2406) **Assessment:** One mid-semester practical quiz (in-class), one final theory exam, one final practical exam, 'Neuroscience in the Media' 3 team-based assessment tasks during seminars and 1 individual written assignment **Practical field work:** Weekly 1.5 hour practical class **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of functional neuroanatomy and systems neuroscience, and an appreciation that neuroscience is a constantly evolving field. There will be a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities. The neural circuits and mechanisms that control somatic and autonomic motor systems, motivated behaviours, emotions, and other higher order functions will be explored in great detail based on current neuroscience literature. Practical classes will allow students to identify and learn the functions of critical anatomical structures in human brain and spinal cord specimens. Reading and interpreting images from functional and structural brain imaging techniques will be incorporated into the neuroanatomy practical classes, and develop an appreciation of how these technologies can be used in neuroscience research. The Neuroscience in the Media seminars will develop neuroscience literature searching skills as well as developing critical thinking and analysis of the accuracy of themedia portrayal of neuroscience research. Building on these skills and working in small groups, students will re-frame and communicate neuroscience evidence through the production of a short video. Students will also learn the skills required to write an unbiased and accurate popular media article based on a recent neuroscience research paper. This unit will develop key attributes that are essential for science graduates as they move forward in their careers.

Textbooks

Nolte's. The Human Brain by Todd Vanderah and Douglas Gould. 7th Ed, Elsevier, 2015

The Human Brain in Photographs and Diagrams by John Nolte. 4th Ed, Mosby, 2013

NEUR3905
Functional Neuroanatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Paul Austin **Session:** Semester 1 **Classes:** Two one-hour lectures per week, 8 one-hour seminars **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3005 **Assumed knowledge:** [ANAT2010 or ANAT2910) or (BMED2401 and 12 additional credit points of BMED240X) **Assessment:** One mid-semester practical quiz (in-class), one final theory exam, one final practical exam, Journal Club participation, Journal Club presentation and 1 individual written assignment **Practical field work:** Weekly 1.5 hour practical class **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of functional neuroanatomy and systems neuroscience, and an appreciation that neuroscience is a constantly evolving field. There will be a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities. The neural circutis and mechanisms that control somatic and autonomic motor systems, motivated behaviours, emotions, and other higher order functions will be explored in great detail based on current neuroscience literature. Practical classes will allow students to identify and learn the functions of critical anatomical structures in human brain and spinal corde specimens. Reading and interpreting images from functional ans tructural brain imaging techniques will be incorporated intot the neuroanatomy practical classes, and develop an appreciation of how these technologies can be used in neuroscience research. By undertaking the advanced unit students will participate in weekly small group seminars under the guidance of a research-active academic. The seminars will take the form of a Journal Club, a style practiced widely in research laboratories around the world. The aim of the Journal Club is to develop critical thinking and detailed knowledge in a specific area of neuroscience research through group discussions. The Journal Club will also develop the skills required to lead a discussion in a small group setting and construct a neuroscience review article. This unit will develop key attributes that are essential for science graduates as they move forward in their careers.

Textbooks

Nolte. Nolte's The Human Brain by Todd. Vanderah and Douglas Gould. 7th Ed, Elsevier, 2015

The Human Brain in Photographs and Diagrams by John Nolte. 4th Ed, Mosby, 2013

NEUR3006
Neural Information Processing

Credit points: 6 **Teacher/Coordinator:** A/Prof Bill Phillips **Session:** Semester 1 **Classes:** two lectures, 1 two-hour research paper session (journal club, 8 weeks) **Prerequisites:** PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X) **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3906 **Assessment:** one 2hr exam, 1500w essay, paper session oral presentation and participation marks, one prac report plus prac quizzes **Practical field work:** 1 x 3hour Prac (total of 5 such practical sessions) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit provides an introduction the mechanisms that drive neurons and neural circuits throughout the brain and body. The lectures explore how signal intensity is translated into nerve impulse codes and how this information is again translated through synapses to convey and interpret information about the external world, to control the body and to record information for future use (learning and memory). We also consider how sensory and motor information is integrated through neural circuits in the brain and spinal cord. Practical classes introduce some of the different ways in which the workings of the brain are studied. Each student chooses a journal club that focuses on a specific topic in neuroscience. In the weekly sessions, group members read, present and interpret original research papers, developing a deep understanding of the emerging scientific evidence in the topic area. This senior year unit of study will develop skills in critical analysis, interpretation and communication of new evidence.

Textbooks

Kandel, Schwartz, Jessel, Sigelbaum, Hudspeth. Principles of Neural Science. 5th Ed, Elsevier, NY, 2013

NEUR3906
Neural Information Processing (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dario Protti **Session:** Semester 1 **Classes:** 1 hour lectures per week **Prerequisites:** A mark of 75 or above in [PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X)] **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3006 **Assessment:** One 2hr exam, prac assessment consisting of one group poster presentation and two short MCQ quizzes, one advanced prac report, one written grant proposal (up to 2,000 words) and oral presentation of grant proposal. **Practical field work:** 1 x 3hour Prac (total of 6 such practical sessions) with the mainstream course and 3-4 x 3 hour advanced pracs. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit provides an introduction into the mechanisms that drive neurons and neural circuits throughout the brain and body. The lectures explore how signal intensity is translated into nerve impulse codes and how this information is again translated through synapses to convey and interpret information about the external world, to control the body and to record information for future use. We also consider how sensory and motor information is integrated through neural circuits in the brain and spinal cord. Practical classes introduce some of the different ways in which the workings of the brain are studied. This senior year unit of study will develop skills in critical analysis, interpretation and communication of new evidence.

Textbooks

Kandel, Schwartz, Jessel, Sigelbaum, Hudspeth. Principles of Neural Science. 5th Ed, Elsevier, NY, 2013

PCOL3022
Neuropharmacology

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prohibitions:** PCOL3922 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

PCOL3922
Neuropharmacology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prerequisites:** An annual average mark of 70 or above in the previous year **Prohibitions:** PCOL3022 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

PSYC3014
Behavioural and Cognitive Neuroscience

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour practical per week. **Prerequisites:** [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **Prohibitions:** PSYC3914 **Assessment:** One 2 hour exam, one major essay/report 2000-2500 words, tutorial quizzes and participation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on approaches to studying neurosciences incorporating molecular, pre-clinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. The implications of focal cognitive deficits in neurological patients for models of normal cognitive function will also be explored. Specific topics to be covered will be selected from the following areas: sensorimotor integration and the neural and molecular basis of learning and memory, attention, language, visual cognition and praxis. In addition to lectures, a practical component will cover basic neuroanatomy and neuroscientific methods. The practical component will also introduce students to experimental and neuropsychological approaches to studying the relationahip between brain and behaviour.

PSYC3914
Behavioural and Cognitive Neuroscience Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Two lectures, one 1 hour tutorial and one 2 hour practical per week. **Prerequisites:** [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **Prohibitions:** PSYC3014 **Assessment:** One 2 hour exam (end of semester), one quiz (mid-semester), one presentation, one written assignment (lab report), attendance and participation in tutorial/practical exercises (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on approaches to studying neurosciences incorporating molecular, pre-clinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. Specific topics to be covered will be selected from the following areas: sensorimotor integration, and the neural and molecular basis of learning and memory, attention, language, visual cognition and praxis. The lecture material will be the same as for PSYC3014, however, the practical class is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. The practical component of the advanced stream will cover basic neuroanatomy, histology and neuropharmacology and will introduce students to experimental approaches to studying brain-behaviour relationships.

Minor core

NEUR3005
Functional Neuroanatomy

Credit points: 6 **Teacher/Coordinator:** Dr Paul Austin **Session:** Semester 1 **Classes:** Two one-hour lectures per week, one guest leacture, 3 two-hour seminars **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3905 **Assumed knowledge:** [ANAT2010 or ANAT2910 or (BMED2401 and 12 additional credit points of BMED2402, BMED2403, BMED2405, BMED2406) **Assessment:** One mid-semester practical quiz (in-class), one final theory exam, one final practical exam, 'Neuroscience in the Media' 3 team-based assessment tasks during seminars and 1 individual written assignment **Practical field work:** Weekly 1.5 hour practical class **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of functional neuroanatomy and systems neuroscience, and an appreciation that neuroscience is a constantly evolving field. There will be a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities. The neural circuits and mechanisms that control somatic and autonomic motor systems, motivated behaviours, emotions, and other higher order functions will be explored in great detail based on current neuroscience literature. Practical classes will allow students to identify and learn the functions of critical anatomical structures in human brain and spinal cord specimens. Reading and interpreting images from functional and structural brain imaging techniques will be incorporated into the neuroanatomy practical classes, and develop an appreciation of how these technologies can be used in neuroscience research. The Neuroscience in the Media seminars will develop neuroscience literature searching skills as well as developing critical thinking and analysis of the accuracy of themedia portrayal of neuroscience research. Building on these skills and working in small groups, students will re-frame and communicate neuroscience evidence through the production of a short video. Students will also learn the skills required to write an unbiased and accurate popular media article based on a recent neuroscience research paper. This unit will develop key attributes that are essential for science graduates as they move forward in their careers.

Textbooks

Nolte's. The Human Brain by Todd Vanderah and Douglas Gould. 7th Ed, Elsevier, 2015

The Human Brain in Photographs and Diagrams by John Nolte. 4th Ed, Mosby, 2013

NEUR3905
Functional Neuroanatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Paul Austin **Session:** Semester 1 **Classes:** Two one-hour lectures per week, 8 one-hour seminars **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3005 **Assumed knowledge:** [ANAT2010 or ANAT2910) or (BMED2401 and 12 additional credit points of BMED240X) **Assessment:** One mid-semester practical quiz (in-class), one final theory exam, one final practical exam, Journal Club participation, Journal Club presentation and 1 individual written assignment **Practical field work:** Weekly 1.5 hour practical class **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of functional neuroanatomy and systems neuroscience, and an appreciation that neuroscience is a constantly evolving field. There will be a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities. The neural circutis and mechanisms that control somatic and autonomic motor systems, motivated behaviours, emotions, and other higher order functions will be explored in great detail based on current neuroscience literature. Practical classes will allow students to identify and learn the functions of critical anatomical structures in human brain and spinal corde specimens. Reading and interpreting images from functional ans tructural brain imaging techniques will be incorporated intot the neuroanatomy practical classes, and develop an appreciation of how these technologies can be used in neuroscience research. By undertaking the advanced unit students will participate in weekly small group seminars under the guidance of a research-active academic. The seminars will take the form of a Journal Club, a style practiced widely in research laboratories around the world. The aim of the Journal Club is to develop critical thinking and detailed knowledge in a specific area of neuroscience research through group discussions. The Journal Club will also develop the skills required to lead a discussion in a small group setting and construct a neuroscience review article. This unit will develop key attributes that are essential for science graduates as they move forward in their careers.

Textbooks

Nolte. Nolte's The Human Brain by Todd. Vanderah and Douglas Gould. 7th Ed, Elsevier, 2015

The Human Brain in Photographs and Diagrams by John Nolte. 4th Ed, Mosby, 2013

PSYC3014
Behavioural and Cognitive Neuroscience

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour practical per week. **Prerequisites:** [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **Prohibitions:** PSYC3914 **Assessment:** One 2 hour exam, one major essay/report 2000-2500 words, tutorial quizzes and participation (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on approaches to studying neurosciences incorporating molecular, pre-clinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. The implications of focal cognitive deficits in neurological patients for models of normal cognitive function will also be explored. Specific topics to be covered will be selected from the following areas: sensorimotor integration and the neural and molecular basis of learning and memory, attention, language, visual cognition and praxis. In addition to lectures, a practical component will cover basic neuroanatomy and neuroscientific methods. The practical component will also introduce students to experimental and neuropsychological approaches to studying the relationahip between brain and behaviour.

PSYC3914
Behavioural and Cognitive Neuroscience Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Two lectures, one 1 hour tutorial and one 2 hour practical per week. **Prerequisites:** [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **Prohibitions:** PSYC3014 **Assessment:** One 2 hour exam (end of semester), one quiz (mid-semester), one presentation, one written assignment (lab report), attendance and participation in tutorial/practical exercises (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on approaches to studying neurosciences incorporating molecular, pre-clinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. Specific topics to be covered will be selected from the following areas: sensorimotor integration, and the neural and molecular basis of learning and memory, attention, language, visual cognition and praxis. The lecture material will be the same as for PSYC3014, however, the practical class is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. The practical component of the advanced stream will cover basic neuroanatomy, histology and neuropharmacology and will introduce students to experimental approaches to studying brain-behaviour relationships.

Nutrition and Dietetics

Study in the area of Nutrition and Dietetics is taught by the School of Life and Environmental Sciences in the Faculty of Science. Units of study in this program are available at standard level.

About the program

Students receive practical training in all aspects of human nutrition including food science, nutritional science, dietary assessment and research methodology, medical nutrition, public health, and food service management, and have access to eminent dietitians at the cutting edge of dietetic and nutrition research and practice. The program has full accreditation from the professional body, the Dietitians Association of Australia.

Requirements for completion

A program in Nutrition and Dietetics requires 72 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)A 48 credit point major in Nutrition Science

First year

Core: BIOL1XX8 and CHEM1XX2

Second year

Core: PHSI2X05 and PHSI2X06

Third year

Students complete units towards the Nutrition Science major.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000 level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Nutrition and Dietetics: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/science/life-environment
E soles.education@sydney.edu.au
T +61 2 9351 4262

Address:
Level 3 West, The Hub, Room 3213
Charles Perkins Centre Education and Research Hub D17
University of Sydney NSW 2006

Ms Wendy Stuart-Smith
E wendy.stuart-smith@sydney.edu.au

T +61 2 8627 1726

Learning Outcomes

Students who graduate from Nutrition and Dietetics will be able to:

1. Develop strong skills and knowledge around the biological and biochemical sciences
2. Develop discipline-specific laboratory and research skills and knowledge
3. Develop skills in critical thinking
4. Develop presentation skills in a research environmentParticipate in multidisciplinary projects
5. Understand nutrient requirements, how nutrients are processed and utilised within the body, across the lifespan
6. Understand nutrient sensing and what happens when things go wrong
7. Understand whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions, as well as obesity and diabetes
8. Develop an understanding of energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells
9. Understand how the modern concepts of metabolomics, coupled with molecular biology methods and studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states
10. Experience in a wide range of techniques used in modern medical and metabolic biochemistry
11. Broaden the understanding of the impact of food production, technology and processing of food and the impact this has on the food that people eat
12. Strengthen their skills and knowledge in cross disciplinary units on food safety, food science and processing
13. Explore big datasets.

Nutrition and Dietetics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
NUTRITION SCIENCE			
Nutrition and Dietetics program			
This program is only available to students enrolled in the Bachelor of Science and Master of Nutrition and Dietetics double degree.			
A program in Nutrition and Dietetics requires 72 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) A 48 credit point major in Nutrition Science			
Nutrition Science major			
A major in Nutrition Science requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units			
Nutrition Science minor			
A minor in Nutrition Science requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Program core			
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
CHEM1012 **Fundamentals of Chemistry 1B**	6	**P** CHEM1XX1 **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992	Semester 2
CHEM1112 **Chemistry 1B**	6	**P** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992	Semester 1 Semester 2
CHEM1912 **Chemistry 1B (Advanced)**	6	**P** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 *Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.*	Semester 2
CHEM1992 **Chemistry 1B (Special Studies Program)**	6	**P** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 *Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Major and minor core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
2000-level units of study			
Program core			
PHSI2005 **Integrated Physiology A**	6	**P** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PHSI2905 **Integrated Physiology A (Advanced)**	6	**P** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PHSI2006 **Integrated Physiology B**	6	**P** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2906 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units is highly recommended for progression to Senior Physiology. It is recommended that PHSI2005 is completed before enrolling in PHSI2006.*	Semester 2
PHSI2906 **Integrated Physiology B (Advanced)**	6	**P** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2006 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 2
Major and minor core			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
BCMB2002 **Proteins in Cells**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2902	Semester 2
BCMB2902 **Proteins in Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2002	Semester 2
3000-level units of study			
Major core			
NUTM3001 **Introductory Nutrition and Metabolism**	6	**A** PHSI2X05 and PHSI2X06 **P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
NUTM3004 **Metabolic Cybernetics**	6	**A** PHSI2X0X and (MATH1XX5 or ATHK1001) **P** [6cp from (BCHM2X72 or BCMB2X01) and 6cp from (BCHM2X71 or BCMB2X02 or DATA2002 or GEGE2X01 or MBLG2X7X or BIOL2XXX or PHSI2X0X)] OR (BMED2401 and BMED2405) **N** NUTM3002 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
AGEN3004 **Food Processing and Value Adding**	6	**P** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX)	Semester 1
Major selective			
BCHM3082 **Medical and Metabolic Biochemistry**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3982 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3982 **Medical and Metabolic Biochemistry (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3082	Semester 2
BCHM3071 **Molecular Biology and Biochemistry-Genes**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3971 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3971 **Molecular Biology and Biochem-Genes (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3071 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3081 **Mol Biology and Biochemistry-Proteins**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3981 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3981 **Mol Biology and Biochem-Proteins (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3081 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3072 **Human Molecular Cell Biology**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3972 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3972 **Human Molecular Cell Biology (Advanced)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3072 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3XXX to be developed for offering in 2019.			
Minor core			
NUTM3001 **Introductory Nutrition and Metabolism**	6	**A** PHSI2X05 and PHSI2X06 **P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3082 **Medical and Metabolic Biochemistry**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3982 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3982 **Medical and Metabolic Biochemistry (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3082	Semester 2

Nutrition and Dietetics

NUTRITION SCIENCE

Nutrition and Dietetics program

This program is only available to students enrolled in the Bachelor of Science and Master of Nutrition and Dietetics double degree.A program in Nutrition and Dietetics requires 72 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) A 48 credit point major in Nutrition Science

Nutrition Science major

A major in Nutrition Science requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units(iv) 6 credit points of 3000-level selective units

Nutrition Science minor

A minor in Nutrition Science requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Program core

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

CHEM1012
Fundamentals of Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1XX1 **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Fundamentals of Chemistry 1B is built on a satisfactory prior knowledge of Fundamentals of Chemistry 1A. Compared to the mainstream Chemistry 1B, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit requires completion of an online supplementary course.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1112
Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2 **Classes:** 1x3-hr lecture; 1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviours, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do we develop lotions that don't burn us, how do we measure UV absorption by sunscreens, how can we measure and alter soil pH, how are sticky things made, and how do we determine the concentration of vitamin C in juice? Through enquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B is built on a satisfactory prior knowledge of Chemistry 1A.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1912
Chemistry 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B (Advanced) is built on a satisfactory prior knowledge of Chemistry 1A (Advanced). Compared to the mainstream Chemistry 1B, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1992
Chemistry 1B (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 12 weeks **Prerequisites:** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 **Assessment:** quizzes, assignment, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how food and medicines work, the properties of materials and substances. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as a demonstrated aptitude. Chemistry 1B (Special Studies Program) is restricted to students who have gained a Distinction in Chemistry 1A (Special Studies Program) or by invitation. The practical work syllabus for Chemistry 1B (Special Studies Program) is very different from that for Chemistry 1B and Chemistry 1B (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1B (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Major and minor core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you.

Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

2000-level units of study

Program core

PHSI2005
Integrated Physiology A

Credit points: 6 **Teacher/Coordinator:** Dr Michael Morris **Session:** Semester 1 **Classes:** Three 1 hour lectures per week. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual written assessments, and quizzes (100%) **Practical field work:** One 3 hour practical or one 3 hour tutorial per week. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study offers an introduction to the basic concepts underpinning physiology, excitable cell (nerve and muscle) physiology, as well as the functions of the nervous system (central processing, and sensory and motor systems). It also incorporates cardiovascular and exercise physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Tutorial sessions develop critical thinking, the integrative nature of physiology, and generic skills in scientific writing and presentation. The practicals and tutorials also emphasise group learning and team work.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 7th edition. 2015. ISBN-10: 0321981227; ISBN-13: 978-0321981226 (International Edition)

PHSI2905
Integrated Physiology A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 1 **Classes:** Five 1 hour lectures, one 3 hour practical and one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. Students will also be exempt from all Inquiry-based learning tutorials. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2005 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2005. This unit of study offers a basic introduction to the functions of the nervous system, excitable cell (nerve and muscle) physiology, sensory and motor systems, and central processing. It also incorporates haematology and cardiovascular physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Inquiry-based learning sessions develop critical thinking and generic skills while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2010. ISBN 10:0-321-1750071; ISBN 13:978-0-321-750075 (International Edition).

PHSI2006
Integrated Physiology B

Credit points: 6 **Teacher/Coordinator:** Dr Bronwyn McAllan **Session:** Semester 2 **Classes:** Three 1 hour lectures per week, and one 3 hour practical or one 3 hour tutorial per week. There will be one 4 hour practical session. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2906 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** Two written exams; group and individual written and oral presentations (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units is highly recommended for progression to Senior Physiology. It is recommended that PHSI2005 is completed before enrolling in PHSI2006.

This unit of study offers a basic introduction to the functions of the remaining body systems: gastrointestinal, respiratory, haematology, endocrine, reproductive and renal. The practical component involves experiments on humans and computer simulations, with an emphasis on hypothesis generation and data analysis. The tutorial sessions develop critical thinking and graduate attributes while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2012. ISBN-10: 0321750071. ISBN-13: 978-0321750075.

PHSI2906
Integrated Physiology B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 2 **Classes:** Three 1 hour lectures per week, and one 3 hour practical and/or one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2006 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2006 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2006. This unit of study gives a basic introduction to the remaining of the body systems: gastrointestinal, respiratory, endocrine, reproductive and renal. The practical component involves simple experiments on humans, isolated tissues, and computer simulations, with an emphasis on hypothesis generation and data analysis. Both oral and written communication skills are emphasised, as well as group learning. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2012. ISBN 10:0-321-750071; ISBN 13:978-0-321-750075 (International Edition).

Major and minor core

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901
Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2002
Proteins in Cells

Credit points: 6 **Teacher/Coordinator:** Dr Sandro Ataide **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; one 4-hour practical/tutorial session per week **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2071 or BCHM2971 or BCMB2902 **Assessment:** Assignments, skills-based assessment, quiz, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

A single human cell contains billions of protein molecules that are constantly in motion. Why so many? What are they doing? And, how are they doing it? In simple terms, proteins define the function of and drive almost every process within cells. In this unit of study you will learn about the biochemistry of proteins in their natural environment - within cells - with a focus on eukaryotes including plant and other cell types. You will discover the dynamic interplay within and between proteins and other cellular components and how the physical properties of proteins dictate function. You will discover how proteins are compartmentalized, modified, folded, transported in and between cells, the mechanisms by which proteins regulate biological activities, interact and transport molecules across membranes, and how mutations in proteins can lead to pathological consequences. Our practicals, other guided and online learning sessions will introduce you to a wide range of currently utilised techniques for protein biochemistry ranging from protein visualization, quantification, purification and enzymatic activity, to in silico studies and cellular targeting experiments. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the cellular and molecular biosciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2902
Proteins in Cells (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Sandro Ataide **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; one 4-hour practical/tutorial session per week **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2071 or BCHM2971 or BCMB2002 **Assessment:** Assignment, skills-based assessment, quiz, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

A single human cell contains billions of protein molecules that are constantly in motion. Why so many? What are they doing? And, how are they doing it? In simple terms, proteins define the function of and drive almost every process within cells. In this unit of study you will learn about the biochemistry of proteins in their natural environment - within cells - with a focus on eukaryotes including plant and other cell types. You will discover the dynamic interplay within and between proteins and other cellular components and how the physical properties of proteins dictate function. You will discover how proteins are compartmentalized, modified, folded, transported in and between cells, the mechanisms by which proteins regulate biological activities, interact and transport molecules across membranes, and how mutations in proteins can lead to pathological consequences. There will be a research-focused approach to the advanced practical component, including real and virtual extensions to key experiments. This approach will continue in the lecture series with several unique advanced lectures covering current research topics. You will further investigate a selected area of interest from these topics using original source material and present your findings through an oral presentation in dedicated advanced tutorials.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

3000-level units of study

Major core

NUTM3001
Introductory Nutrition and Metabolism

Credit points: 6 **Teacher/Coordinator:** Wendy Stuart-Smith **Session:** Semester 1 **Classes:** Two lectures, one tutorial per week, 1-5hour laboratory/presentation class most weeks **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Assumed knowledge:** PHSI2X05 and PHSI2X06 **Assessment:** In semester reports, presentations and quizzes (40%) one 2.5-hour exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Nutrition is a multidisciplinary science that covers the role of food in health and disease. Advances in biomolecular science have increased the focus of nutrition on the metabolic pathways that transform nutrients. This unit of study aims to explore fundamentals in nutritional science to develop an understanding of the core concepts in human nutrition through exploring the role of macro- and micro-nutrients and their interaction across the lifespan, mostly in the healthy individual. The focus will be the biochemical reactions that take place in cells, how these are influenced by different nutrients and what are the implications for the whole body. This unit of study will consider the structure and chemical characteristics of nutrients, their metabolism, and their roles in health and disease. This unit of study will explore how animal models, cell culture techniques and human trials have contributed to advancing nutritional science. Examples from current research will be used to illustrate how nutrients are metabolised, mostly in health, and the expanding scope of research in human nutrition.

Textbooks

Essentials of Human Nutrition 4th Edition, 2012. Edited by Jim Mann and A. Stewart Truswell. Oxford University Press. ISBN: 9780199566341*

NUTM3004
Metabolic Cybernetics

Credit points: 6 **Teacher/Coordinator:** Dr Kim Bell-Anderson **Session:** Semester 2 **Classes:** Two lectures, one tutorial, 3-hour practical per week on average **Prerequisites:** [6cp from (BCHM2X72 or BCMB2X01) and 6cp from (BCHM2X71 or BCMB2X02 or DATA2002 or GEGE2X01 or MBLG2X7X or BIOL2XXX or PHSI2X0X)] OR (BMED2401 and BMED2405) **Prohibitions:** NUTM3002 **Assumed knowledge:** PHSI2X0X and (MATH1XX5 or ATHK1001) **Assessment:** One 1.5-hour exam (40%), 1000w essay (20%), data exercises (10%), research project (30%, includes multimedia group work (10%), presentation group work (10%), 500w student reflection (5%), mentor assessment (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Obesity is a worldwide health problem driven by a complex intersection between genetics and the environment. This interdisciplinary unit of study aims to explore recent advances in 'omics' technology and big data analysis. The focus will be on how to tackle highly complex questions such as why some individuals become obese and others don't. The problem will be presented from a range of scientific points of view so that students will be able to understand the contextual nature of bringing multiple disciplines to bear on a really important biological problem. Students will be provided a research training opportunity to contribute to our understanding of the relevant problems of over-nutrition in our society. Collaborative research is supported by lectures and tutorials on nutrition science, 'big data' management strategies and approaches to data analysis.

AGEN3004
Food Processing and Value Adding

Credit points: 6 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien **Session:** Semester 1 **Classes:** Two 1-hour lectures per week **Prerequisites:** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX) **Assessment:** Two individual assignments (10% + 20%), one group processing report (20%), one group oral presentations (10%), one 2-hour final exam (40%) **Practical field work:** One 3-hour practical or excursion per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

From the grinding of grains to the drying of meats, humans have been processing their food since the dawn of civilisation. Over the decades, many traditional processing methods have become industrialised, while new processing technologies have emerged, quietly revolutionising our food systems, diets and cultures. In this unit of study, students examine the biochemical and physicochemical transformations that occur in food materials during processing and how processing parameters affect the fulfilment of food quality, shelf-life, and safety objectives. The unit is roughly organised into modules on (1) processing to modify food structure; (2) processing for preservation; and value-adding, focused on (3) healthier food and (4) fermentation as interesting case studies in food processing.The unit will include lectures, laboratory sessions, group work and visits to food processing facilities.

Textbooks

No prescribed textbooks

Major selective

BCHM3082
Medical and Metabolic Biochemistry

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3982 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with molecular biology methods and studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry.

BCHM3982
Medical and Metabolic Biochemistry (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3082 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with new methods, including magnetic resonance techniques and molecular biology methods, as well as studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry. Qualified students will attend some lectures/practical classes in common with BCHM3082 and some separate lectures/ practical classes in which more sophisticated topics in metabolic biochemistry will be covered.

BCHM3071
Molecular Biology and Biochemistry-Genes

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3971 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester practical work and assignments (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3971
Molecular Biology and Biochem-Genes (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3071 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

The lecture component of this unit of study is the same as BCHM3071. Qualified students will attend seminars/practical classes in which more sophisticated topics in gene expression and manipulation will be covered.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3081
Mol Biology and Biochemistry-Proteins

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Prof Joel Mackay **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3981 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the functions of proteins in living organisms, with a focus on eukaryotic and particularly human systems. Its lecture component deals with how proteins adopt their biologically active forms, including discussions of protein structure, protein folding and how recombinant DNA technology can be used to design novel proteins with potential medical or biotechnology applications. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of proteins. It also covers physiologically and medically important aspects of proteins in living systems, including the roles of chaperones in protein folding inside cells, the pathological consequences of misfolding of proteins, how proteins are sorted to different cellular compartments and how the biological activities of proteins can be controlled by regulated protein degradation. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology and protein biochemistry laboratories.

Textbooks

Williamson M. How Proteins Work. Garland. 2012.

BCHM3981
Mol Biology and Biochem-Proteins (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Prof Joel Mackay **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3081 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the functions of proteins in living organisms, with a focus on eukaryotic and particularly human systems. Its lecture component deals with how proteins adopt their biologically active forms, including discussions of protein structure, protein folding and how recombinant DNA technology can be used to design novel proteins with potential medical or biotechnology applications. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of proteins. It also covers physiologically and medically important aspects of proteins in living systems, including the roles of chaperones in protein folding inside cells, the pathological consequences of misfolding of proteins, how proteins are sorted to different cellular compartments and how the biological activities of proteins can be controlled by regulated protein degradation. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology and protein biochemistry laboratories.

The lecture component of this unit of study is the same as BCHM3081. Qualified students will attend seminars/practical classes in which more sophisticated topics in protein biochemistry will be covered.

Textbooks

Williamson M. How Proteins Work. Garland. 2012.

BCHM3072
Human Molecular Cell Biology

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3972 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BCHM3972

Human Molecular Cell Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3072 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

The lecture component of this unit of study is the same as BCHM3072. Qualified students will attend seminars/practical classes in which more sophisticated topics in modern molecular cell biology will be covered.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

MICR3XXX to be developed for offering in 2019.

Minor core

NUTM3001

Introductory Nutrition and Metabolism

Credit points: 6 **Teacher/Coordinator:** Wendy Stuart-Smith **Session:** Semester 1 **Classes:** Two lectures, one tutorial per week, 1-5hour laboratory/presentation class most weeks **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Assumed knowledge:** PHSI2X05 and PHSI2X06 **Assessment:** In semester reports, presentations and quizzes (40%) one 2.5-hour exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Nutrition is a multidisciplinary science that covers the role of food in health and disease. Advances in biomolecular science have increased the focus of nutrition on the metabolic pathways that transform nutrients. This unit of study aims to explore fundamentals in nutritional science to develop an understanding of the core concepts in human nutrition through exploring the role of macro- and micro-nutrients and their interaction across the lifespan, mostly in the healthy individual. The focus will be the biochemical reactions that take place in cells, how these are influenced by different nutrients and what are the implications for the whole body. This unit of study will consider the structure and chemical characteristics of nutrients, their metabolism, and their roles in health and disease. This unit of study will explore how animal models, cell culture techniques and human trials have contributed to advancing nutritional science. Examples from current research will be used to illustrate how nutrients are metabolised, mostly in health, and the expanding scope of research in human nutrition.

Textbooks

Essentials of Human Nutrition 4th Edition, 2012. Edited by Jim Mann and A. Stewart Truswell. Oxford University Press. ISBN: 9780199566341*

BCHM3082

Medical and Metabolic Biochemistry

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3982 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with molecular biology methods and studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry.

BCHM3982

Medical and Metabolic Biochemistry (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3082 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with new methods, including magnetic resonance techniques and molecular biology methods, as well as studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry. Qualified students will attend some lectures/practical classes in common with BCHM3082 and some separate lectures/ practical classes in which more sophisticated topics in metabolic biochemistry will be covered.

Nutrition Science

Study in the area of Nutrition and Metabolism is taught by the School of Life and Environmental Sciences in the Faculty of Science. Units of study in this major are available at standard level.

About the major

Nutrition Science is a multidisciplinary area of study that covers the role of food and nutrients in health and disease, across the lifespan. You will explore the basics of biology and biochemistry before focusing on human nutrition. You will have opportunity to investigate nutrition and the effects of nutrients on health and disease from the molecular to the systems level. You will learn how we sense, digest, metabolise and store nutrients and a develop a wide range of laboratory and research skills, including working with big data sets, which will provide a strong foundation for a possible career as a nutrition scientist, a research pathway, or, with additional prerequisites, entry to the Master of Nutrition and Dietetics program.

Requirements for completion

A program in Nutrition and Dietetics requires 72 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)A 48 credit point major in Nutrition Science

A major in Nutrition Science requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)18 credit points of 3000-level core units
(iv)6 credit points of 3000-level selective units

A minor in Nutrition Science is available and articulates to this major.

First year

Core to program: BIOL1XX8, CHEM1XX2
Core to major: BIOL1XX7, CHEM1XX1

Second year

Core to program: PHSI2X05, PHSI2X06
Core to major: BCMB2X01, BCMB2X02

Third year

NUTM3001, NUTM3004, AGEN3004 and 6 credit points from a selection of: BCHM3X82, BCHM3X71, BCHM3X81, BCHM3X72, MICR3XXX
In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Nutrition Science: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 02 9351 4262

Address:
Level 3 West, The Hub, Room 3213
Charles Perkins Centre Education and Research Hub D17
University of Sydney NSW 2006

Dr Kim Bell-Anderson
E kim.bellanderson@sydney.edu.au
T +61 2 9351 6267

Ms Wendy Stuart-Smith
E wendy.stuart-smith@sydney.edu.au
T +61 2 8627 1726

Learning Outcomes

In the first two years of the major program, students will develop strong skills and knowledge around the biological and biochemical sciences, as well as being encouraged to broaden their knowledge across the discipline by selecting relevant elective units of study to complement their chosen major.

At the same time, they will be able to complete cross-disciplinary units to strengthen their skills and knowledge beyond simply what happens once food has been eaten. Food safety, food science and processing would be encouraged, along with human physiology, which provides a systems level approach and framework for nutrition. Students will also develop skills in critical thinking, and discipline-specific laboratory/research skills and knowledge.

The Nutrition Science major at 3000-level will entail three bioscience, and one food science unit of study. In NUTM3001, students learn the basics of human nutrition and metabolism, from nutrient requirements, to how these are processed and utilised within the body, across the lifespan. They also look at how the body senses nutrients and touch on what happens when things go wrong.

The second unit, NUTM3004, allows the students to explore concepts of what happens when things go wrong. This CPC developed unit is highly project-based and multidisciplinary, usually considering big data sets.

In the third core unit, students are provided an option within specific nutrition related units of study from molecular biosciences and physiology, and the fourth unit is an interdisciplinary one, from the Food Science area, aiming to broaden the student’s understanding of the impact of food production, technology and processing of food and the impact this has on the food that people eat.

Nutrition Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
NUTRITION SCIENCE			
Nutrition Science major			
A major in Nutrition Science requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units			
Nutrition Science minor			
A minor in Nutrition Science requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Major and minor core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
2000-level units of study			
Major and minor core			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BCMB2002 **Proteins in Cells**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2902	Semester 2
BCMB2902 **Proteins in Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2002	Semester 2
3000-level units of study			
Major core			
NUTM3001 **Introductory Nutrition and Metabolism**	6	**A** PHSI2X05 and PHSI2X06 **P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NUTM3004 **Metabolic Cybernetics**	6	**A** PHSI2X0X and (MATH1XX5 or ATHK1001) **P** [6cp from (BCHM2X72 or BCMB2X01) and 6cp from (BCHM2X71 or BCMB2X02 or DATA2002 or GEGE2X01 or MBLG2X7X or BIOL2XXX or PHSI2X0X)] OR (BMED2401 and BMED2405) **N** NUTM3002 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
AGEN3004 **Food Processing and Value Adding**	6	**P** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX)	Semester 1
Major selective			
BCHM3082 **Medical and Metabolic Biochemistry**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3982 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3982 **Medical and Metabolic Biochemistry (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3082	Semester 2
BCHM3071 **Molecular Biology and Biochemistry-Genes**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3971 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3971 **Molecular Biology and Biochem-Genes (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3071 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3081 **Mol Biology and Biochemistry-Proteins**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3981 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3981 **Mol Biology and Biochem-Proteins (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3081 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3072 **Human Molecular Cell Biology**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3972 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3972 **Human Molecular Cell Biology (Advanced)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3072 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3XXX to be developed for offering in 2019.			
Minor core			
NUTM3001 **Introductory Nutrition and Metabolism**	6	**A** PHSI2X05 and PHSI2X06 **P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3082 **Medical and Metabolic Biochemistry**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3982 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3982 **Medical and Metabolic Biochemistry (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3082	Semester 2

Nutrition Science

NUTRITION SCIENCE

Nutrition and Dietetics program

This program is only available to students enrolled in the Bachelor of Science and Master of Nutrition and Dietetics double degree.A program in Nutrition and Dietetics requires 72 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) A 48 credit point major in Nutrition Science

Nutrition Science major

A major in Nutrition Science requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units(iv) 6 credit points of 3000-level selective units

Nutrition Science minor

A minor in Nutrition Science requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Program core

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

CHEM1012
Fundamentals of Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1XX1 **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Fundamentals of Chemistry 1B is built on a satisfactory prior knowledge of Fundamentals of Chemistry 1A. Compared to the mainstream Chemistry 1B, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit requires completion of an online supplementary course.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1112
Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2 **Classes:** 1x3-hr lecture; 1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviours, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do we develop lotions that don't burn us, how do we measure UV absorption by sunscreens, how can we measure and alter soil pH, how are sticky things made, and how do we determine the concentration of vitamin C in juice? Through enquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B is built on a satisfactory prior knowledge of Chemistry 1A.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1912
Chemistry 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B (Advanced) is built on a satisfactory prior knowledge of Chemistry 1A (Advanced). Compared to the mainstream Chemistry 1B, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1992
Chemistry 1B (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 12 weeks **Prerequisites:** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 **Assessment:** quizzes, assignment, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how food and medicines work, the properties of materials and substances. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as a demonstrated aptitude. Chemistry 1B (Special Studies Program) is restricted to students who have gained a Distinction in Chemistry 1A (Special Studies Program) or by invitation. The practical work syllabus for Chemistry 1B (Special Studies Program) is very different from that for Chemistry 1B and Chemistry 1B (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1B (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Major and minor core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you.

Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

2000-level units of study

Program core

PHSI2005
Integrated Physiology A

Credit points: 6 **Teacher/Coordinator:** Dr Michael Morris **Session:** Semester 1 **Classes:** Three 1 hour lectures per week. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual written assessments, and quizzes (100%) **Practical field work:** One 3 hour practical or one 3 hour tutorial per week. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study offers an introduction to the basic concepts underpinning physiology, excitable cell (nerve and muscle) physiology, as well as the functions of the nervous system (central processing, and sensory and motor systems). It also incorporates cardiovascular and exercise physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Tutorial sessions develop critical thinking, the integrative nature of physiology, and generic skills in scientific writing and presentation. The practicals and tutorials also emphasise group learning and team work.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 7th edition. 2015. ISBN-10: 0321981227; ISBN-13: 978-0321981226 (International Edition)

PHSI2905
Integrated Physiology A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 1 **Classes:** Five 1 hour lectures, one 3 hour practical and one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. Students will also be exempt from all Inquiry-based learning tutorials. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2005 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2005. This unit of study offers a basic introduction to the functions of the nervous system, excitable cell (nerve and muscle) physiology, sensory and motor systems, and central processing. It also incorporates haematology and cardiovascular physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Inquiry-based learning sessions develop critical thinking and generic skills while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2010. ISBN 10:0-321-1750071; ISBN 13:978-0-321-750075 (International Edition).

PHSI2006
Integrated Physiology B

Credit points: 6 **Teacher/Coordinator:** Dr Bronwyn McAllan **Session:** Semester 2 **Classes:** Three 1 hour lectures per week, and one 3 hour practical or one 3 hour tutorial per week. There will be one 4 hour practical session. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2906 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** Two written exams; group and individual written and oral presentations (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units is highly recommended for progression to Senior Physiology. It is recommended that PHSI2005 is completed before enrolling in PHSI2006.

This unit of study offers a basic introduction to the functions of the remaining body systems: gastrointestinal, respiratory, haematology, endocrine, reproductive and renal. The practical component involves experiments on humans and computer simulations, with an emphasis on hypothesis generation and data analysis. The tutorial sessions develop critical thinking and graduate attributes while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2012. ISBN-10: 0321750071. ISBN-13: 978-0321750075.

PHSI2906
Integrated Physiology B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 2 **Classes:** Three 1 hour lectures per week, and one 3 hour practical and/or one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2006 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2006 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2006. This unit of study gives a basic introduction to the remaining of the body systems: gastrointestinal, respiratory, endocrine, reproductive and renal. The practical component involves simple experiments on humans, isolated tissues, and computer simulations, with an emphasis on hypothesis generation and data analysis. Both oral and written communication skills are emphasised, as well as group learning. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2012. ISBN 10:0-321-750071; ISBN 13:978-0-321-750075 (International Edition).

Major and minor core

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901
Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2002
Proteins in Cells

Credit points: 6 **Teacher/Coordinator:** Dr Sandro Ataide **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; one 4-hour practical/tutorial session per week **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2071 or BCHM2971 or BCMB2902 **Assessment:** Assignments, skills-based assessment, quiz, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

A single human cell contains billions of protein molecules that are constantly in motion. Why so many? What are they doing? And, how are they doing it? In simple terms, proteins define the function of and drive almost every process within cells. In this unit of study you will learn about the biochemistry of proteins in their natural environment - within cells - with a focus on eukaryotes including plant and other cell types. You will discover the dynamic interplay within and between proteins and other cellular components and how the physical properties of proteins dictate function. You will discover how proteins are compartmentalized, modified, folded, transported in and between cells, the mechanisms by which proteins regulate biological activities, interact and transport molecules across membranes, and how mutations in proteins can lead to pathological consequences. Our practicals, other guided and online learning sessions will introduce you to a wide range of currently utilised techniques for protein biochemistry ranging from protein visualization, quantification, purification and enzymatic activity, to in silico studies and cellular targeting experiments. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the cellular and molecular biosciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2902
Proteins in Cells (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Sandro Ataide **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; one 4-hour practical/tutorial session per week **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2071 or BCHM2971 or BCMB2002 **Assessment:** Assignment, skills-based assessment, quiz, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

A single human cell contains billions of protein molecules that are constantly in motion. Why so many? What are they doing? And, how are they doing it? In simple terms, proteins define the function of and drive almost every process within cells. In this unit of study you will learn about the biochemistry of proteins in their natural environment - within cells - with a focus on eukaryotes including plant and other cell types. You will discover the dynamic interplay within and between proteins and other cellular components and how the physical properties of proteins dictate function. You will discover how proteins are compartmentalized, modified, folded, transported in and between cells, the mechanisms by which proteins regulate biological activities, interact and transport molecules across membranes, and how mutations in proteins can lead to pathological consequences. There will be a research-focused approach to the advanced practical component, including real and virtual extensions to key experiments. This approach will continue in the lecture series with several unique advanced lectures covering current research topics. You will further investigate a selected area of interest from these topics using original source material and present your findings through an oral presentation in dedicated advanced tutorials.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

3000-level units of study

Major core

NUTM3001
Introductory Nutrition and Metabolism

Credit points: 6 **Teacher/Coordinator:** Wendy Stuart-Smith **Session:** Semester 1 **Classes:** Two lectures, one tutorial per week, 1-5hour laboratory/presentation class most weeks **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Assumed knowledge:** PHSI2X05 and PHSI2X06 **Assessment:** In semester reports, presentations and quizzes (40%) one 2.5-hour exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Nutrition is a multidisciplinary science that covers the role of food in health and disease. Advances in biomolecular science have increased the focus of nutrition on the metabolic pathways that transform nutrients. This unit of study aims to explore fundamentals in nutritional science to develop an understanding of the core concepts in human nutrition through exploring the role of macro- and micro-nutrients and their interaction across the lifespan, mostly in the healthy individual. The focus will be the biochemical reactions that take place in cells, how these are influenced by different nutrients and what are the implications for the whole body. This unit of study will consider the structure and chemical characteristics of nutrients, their metabolism, and their roles in health and disease. This unit of study will explore how animal models, cell culture techniques and human trials have contributed to advancing nutritional science. Examples from current research will be used to illustrate how nutrients are metabolised, mostly in health, and the expanding scope of research in human nutrition.

Textbooks

Essentials of Human Nutrition 4th Edition, 2012. Edited by Jim Mann and A. Stewart Truswell. Oxford University Press. ISBN: 9780199566341*

NUTM3004
Metabolic Cybernetics

Credit points: 6 **Teacher/Coordinator:** Dr Kim Bell-Anderson **Session:** Semester 2 **Classes:** Two lectures, one tutorial, 3-hour practical per week on average **Prerequisites:** [6cp from (BCHM2X72 or BCMB2X01) and 6cp from (BCHM2X71 or BCMB2X02 or DATA2002 or GEGE2X01 or MBLG2X7X or BIOL2XXX or PHSI2X0X)] OR (BMED2401 and BMED2405) **Prohibitions:** NUTM3002 **Assumed knowledge:** PHSI2X0X and (MATH1XX5 or ATHK1001) **Assessment:** One 1.5-hour exam (40%), 1000w essay (20%), data exercises (10%), research project (30%, includes multimedia group work (10%), presentation group work (10%), 500w student reflection (5%), mentor assessment (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Obesity is a worldwide health problem driven by a complex intersection between genetics and the environment. This interdisciplinary unit of study aims to explore recent advances in 'omics' technology and big data analysis. The focus will be on how to tackle highly complex questions such as why some individuals become obese and others don't. The problem will be presented from a range of scientific points of view so that students will be able to understand the contextual nature of bringing multiple disciplines to bear on a really important biological problem. Students will be provided a research training opportunity to contribute to our understanding of the relevant problems of over-nutrition in our society. Collaborative research is supported by lectures and tutorials on nutrition science, 'big data' management strategies and approaches to data analysis.

AGEN3004
Food Processing and Value Adding

Credit points: 6 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien **Session:** Semester 1 **Classes:** Two 1-hour lectures per week **Prerequisites:** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX) **Assessment:** Two individual assignments (10% + 20%), one group processing report (20%), one group oral presentations (10%), one 2-hour final exam (40%) **Practical field work:** One 3-hour practical or excursion per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

From the grinding of grains to the drying of meats, humans have been processing their food since the dawn of civilisation. Over the decades, many traditional processing methods have become industrialised, while new processing technologies have emerged, quietly revolutionising our food systems, diets and cultures. In this unit of study, students examine the biochemical and physicochemical transformations that occur in food materials during processing and how processing parameters affect the fulfilment of food quality, shelf-life, and safety objectives. The unit is roughly organised into modules on (1) processing to modify food structure; (2) processing for preservation; and value-adding, focused on (3) healthier food and (4) fermentation as interesting case studies in food processing.The unit will include lectures, laboratory sessions, group work and visits to food processing facilities.

Textbooks

No prescribed textbooks

Major selective

BCHM3082
Medical and Metabolic Biochemistry

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3982 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states.These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with molecular biology methods and studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry.

BCHM3982
Medical and Metabolic Biochemistry (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3082 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states.These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with new methods, including magnetic resonance techniques and molecular biology methods, as well as studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry. Qualified students will attend some lectures/practical classes in common with BCHM3082 and some separate lectures/ practical classes in which more sophisticated topics in metabolic biochemistry will be covered.

BCHM3071
Molecular Biology and Biochemistry-Genes

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3971 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester practical work and assignments (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3971
Molecular Biology and Biochem-Genes (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3071 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

The lecture component of this unit of study is the same as BCHM3071. Qualified students will attend seminars/practical classes in which more sophisticated topics in gene expression and manipulation will be covered.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3081
Mol Biology and Biochemistry-Proteins

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Prof Joel Mackay **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3981 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the functions of proteins in living organisms, with a focus on eukaryotic and particularly human systems. Its lecture component deals with how proteins adopt their biologically active forms, including discussions of protein structure, protein folding and how recombinant DNA technology can be used to design novel proteins with potential medical or biotechnology applications. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of proteins. It also covers physiologically and medically important aspects of proteins in living systems, including the roles of chaperones in protein folding inside cells, the pathological consequences of misfolding of proteins, how proteins are sorted to different cellular compartments and how the biological activities of proteins can be controlled by regulated protein degradation. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology and protein biochemistry laboratories.

Textbooks

Williamson M. How Proteins Work. Garland. 2012.

BCHM3981
Mol Biology and Biochem-Proteins (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Prof Joel Mackay **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3081 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the functions of proteins in living organisms, with a focus on eukaryotic and particularly human systems. Its lecture component deals with how proteins adopt their biologically active forms, including discussions of protein structure, protein folding and how recombinant DNA technology can be used to design novel proteins with potential medical or biotechnology applications. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of proteins. It also covers physiologically and medically important aspects of proteins in living systems, including the roles of chaperones in protein folding inside cells, the pathological consequences of misfolding of proteins, how proteins are sorted to different cellular compartments and how the biological activities of proteins can be controlled by regulated protein degradation. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology and protein biochemistry laboratories.

The lecture component of this unit of study is the same as BCHM3081. Qualified students will attend seminars/practical classes in which more sophisticated topics in protein biochemistry will be covered.

Textbooks

Williamson M. How Proteins Work. Garland. 2012.

BCHM3072
Human Molecular Cell Biology

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3972 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BCHM3972

Human Molecular Cell Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3072 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

The lecture component of this unit of study is the same as BCHM3072. Qualified students will attend seminars/practical classes in which more sophisticated topics in modern molecular cell biology will be covered.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

MICR3XXX to be developed for offering in 2019.

Minor core

NUTM3001

Introductory Nutrition and Metabolism

Credit points: 6 **Teacher/Coordinator:** Wendy Stuart-Smith **Session:** Semester 1 **Classes:** Two lectures, one tutorial per week, 1-5hour laboratory/presentation class most weeks **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Assumed knowledge:** PHSI2X05 and PHSI2X06 **Assessment:** In semester reports, presentations and quizzes (40%) one 2.5-hour exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Nutrition is a multidisciplinary science that covers the role of food in health and disease. Advances in biomolecular science have increased the focus of nutrition on the metabolic pathways that transform nutrients. This unit of study aims to explore fundamentals in nutritional science to develop an understanding of the core concepts in human nutrition through exploring the role of macro- and micro-nutrients and their interaction across the lifespan, mostly in the healthy individual. The focus will be the biochemical reactions that take place in cells, how these are influenced by different nutrients and what are the implications for the whole body. This unit of study will consider the structure and chemical characteristics of nutrients, their metabolism, and their roles in health and disease. This unit of study will explore how animal models, cell culture techniques and human trials have contributed to advancing nutritional science. Examples from current research will be used to illustrate how nutrients are metabolised, mostly in health, and the expanding scope of research in human nutrition.

Textbooks

Essentials of Human Nutrition 4th Edition, 2012. Edited by Jim Mann and A. Stewart Truswell. Oxford University Press. ISBN: 9780199566341*

BCHM3082

Medical and Metabolic Biochemistry

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3982 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with molecular biology methods and studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry.

BCHM3982

Medical and Metabolic Biochemistry (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3082 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with new methods, including magnetic resonance techniques and molecular biology methods, as well as studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry. Qualified students will attend some lectures/practical classes in common with BCHM3082 and some separate lectures/ practical classes in which more sophisticated topics in metabolic biochemistry will be covered.

Pathology

Study in Pathology is offered by the Discipline of Infectious Diseases and Immunology in the Sydney Medical School. Units of study in this minor are available at standard and advanced level.

About the minor

The immune system is an integrated network of cells and specialised organs that can respond to external and internal threats. It can be mobilized to protect humans from infections and cancer while simultaneously being the underlying mechanism of major acute and chronic pathologies.

The Pathology minor examines how it is that our immune system can be both the cause and the cure of disease in humans and animals. This is important, as an understanding of pathological mechanisms allows us to think about how our immune system can be manipulated to prevent and treat disease. This minor draws together studies in immunology, pathology, microbiology, biology, biochemistry, and physiology.

Requirements for completion

A minor in Pathology requires 36 credit points, consisting of:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level selective units
(iii)6 credit points of 2000-level core units
(iv)6 credit points of 2000-level selective units
(v)12 credit points of 3000-level core units

First year

CHEM1XX1 and 6 credit points from a selection of BIOL1XX7 and BIOL1XX8 (MEDS1X01 is only available to students enrolled in the Medical Science stream).

Second year

IMMU2101 (MIMI2X02 in 2019) and 6 credit points from a selection of BCMB2X01 and IMMU2X11.

For Medical Science stream students: BMED2404 (MEDS2004 in 2019) and 6 credit points from a selection of MEDS2003 and IMMU2X11. Please note, BMED and MEDS units are only offered to Medical Science stream students.

Third year

Core: CPAT3201 (PATH3X11 in 2019), CPAT3202 (PATH3X12 in 2019).

Contact and further information

W sydney.edu.au/medicine/infectious-diseases-immunology/contact/

Address:
Infectious Diseases and Immunology
Level 5 (East), Charles Perkins Centre hub (D17)
University of Sydney NSW 2006

Associate Professor Scott Byrne
E scott.byrne@sydney.edu.au
T +61 2 9351 7308

Professor Nicholas King
E nicholas.king@sydney.edu.au
T +61 2 9351 4553

Learning Outcomes

Students who graduate from Pathology will be able to:

1. Have grasped the fundamentals of immunology and pathology and be able to apply these to a range of disease contexts
2. Understand how the cells and molecules of our immune system cooperate to keep us healthy and fight disease;
3. Understand the common generic pathophysiological responses to pathological stress in disease;
4. Understand that our immune system can be both the cause and the cure of pathology in humans and animals;
5. Understand the cellular and molecular basis of the pathogenesis of a diverse range of human diseases;
6. Think about how our immune system can be manipulated to prevent and treat disease;
7. Understand that immunology can be applied to the development of novel diagnostic pathology assays;
8. Be competent in a range of valuable immunological and pathological techniques/skills;
9. Apply immunological and pathological approaches to address a diverse range of pathological problems;
10. Appreciate that various therapeutic approaches that target cells and molecules of our immune and other organ systems are leading to breakthroughs in human disease detection, treatment and management.

Pathology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Pathology			
Pathology minor A minor in Pathology requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
Selective			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			
2000-level units of study			
Core			
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
MEDS2004 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
Selective			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
IMMU2X11 and MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Core			
CPAT3201 **Pathogenesis of Human Disease 1**	6	**A** Sound knowledge of biology through meeting pre-requisites **P** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
CPAT3202 **Pathogenesis of Human Disease 2**	6	**A** Sound knowledge of biology through meeting pre-requisites **P** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) **C** CPAT3201 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PATH3X11 and PATH3X12 to be developed for offering in 2019.			

Pathology

Pathology

Pathology minor

A minor in Pathology requires 36 credit points from this table including:(i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 6 credit points of 2000-level core units (iv) 6 credit points of 2000-level selective units (v) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Selective

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks
TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Core

BMED2404
Microbes, Infection and Immunity

Credit points: 6 **Teacher/Coordinator:** Dr Jim Manos **Session:** Semester 2 **Classes:** Two lectures and one practical per week, two tutorials **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), in-semester assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study begins by introducing the concepts of disease transmission, pathogenicity and virulence mechanisms of microbes. For a full understanding of the process of infection, the structure and function of pathogenic microorganisms is examined. How the body deals with injury and infection is discussed by exploring barriers to infection and host response once those barriers are breached. The body's response to such physical damage is dealt with in a series of lectures on wound healing, clotting and inflammation, and is complemented by discussion of the pharmacological basis of anti-inflammatory drugs. This is followed by a comprehensive discussion of molecular and cellular immune responses to pathogen invasion. In particular, this gives students an appreciation of the processing of antigens, the structure, production and diversity of antibodies, the operation of the complement system and mechanisms for recognition and destruction of invading microbes. The unit concludes with an overview of microbial diseases, the characteristics of causative agents, pathogenesis and symptoms as well as treatment and control and culminates with exploring current issues of antibiotic resistance, important emerging infections and vaccination strategies.

Practical classes illustrate and underpin the lecture content. Students will investigate normal flora, host defences and medically important microbes and will obtain experience in, and an understanding of, a range of techniques in bacteriology. In these practical sessions experience will be gained handling live, potentially pathogenic microbes.

Textbooks
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
Basic Immunology: Functions and Disorders of the Immune System. Abass AK and Lichtman AH WB Saunders, 4th Edition, 2013
Robbins Basic Pathology Kumar V, Abbas AK and Aster J Saunders, Philadelphia, 9th Edition, 2013

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1 **Assessment:** Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks
Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

MEDS2004 and MIMI2X02 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

Selective

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for

cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901

Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

IMMU2X11 and MEDS2003 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Core

CPAT3201

Pathogenesis of Human Disease 1

Credit points: 6 **Teacher/Coordinator:** A/Prof Paul Witting **Session:** Semester 2 **Classes:** Three 1-hour lectures and one 3-hour research tutorial per week. **Prerequisites:** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) **Assumed knowledge:** Sound knowledge of biology through meeting pre-requisites **Assessment:** One 2-hour exam (60%), one major research essay (1500w) (20%), two 0.5-hour in-semester exams (20%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The Pathogenesis of Human Disease 1 unit of study modules will provide a theoretical background to the scientific basis of the pathogenesis of disease. Areas covered in theoretical modules include: tissue responses to exogenous factors, adaptive responses to foreign agents, cardiovascular/pulmonary/gut responses to disease, forensic science, neuropathology and cancer. The aims of the course are: - To give students an overall understanding of the fundamental biological mechanisms governing disease pathogenesis in human beings. - To introduce to students basic concepts of the pathogenesis, natural history and complications of common human diseases. - To demonstrate and exemplify differences between normality and disease. - To explain cellular aspects of certain pathological processes. Together with CPAT3202, the unit of study would be appropriate for those who intend to proceed to Honours research, to postgraduate studies such as Medicine or to careers in biomedical areas such as hospital science. Enquires should be directed to anthea.matsimanis@sydney.edu.au

Textbooks

Kumar, Abbas and Aster. Robbins Basic Pathology, 9th edition. Saunders. 2012.

CPAT3202

Pathogenesis of Human Disease 2

Credit points: 6 **Teacher/Coordinator:** A/Prof Paul Witting **Session:** Semester 2 **Classes:** Practical Module **Prerequisites:** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) **Corequisites:** CPAT3201 **Assumed knowledge:** Sound knowledge of biology through meeting pre-requisites **Assessment:** One 2-hour exam (60%), Museum Practical Reports (40%). **Practical field work:** One 2-hour microscopic practical and one 2-hour museum practical per week. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The Pathogenesis of Human Disease 2 unit of study modules will provide a practical background to the scientific basis of the pathogenesis of disease. Areas covered in practical modules include disease specimen evaluation on a macroscopic and microscopic basis. The aims of the course are: - To enable students to gain an understanding of how different organ systems react to injury and to apply basic concepts of disease processes. - To equip students with skills appropriate for careers in the biomedical sciences and for further training in research or professional degrees. At the end of the course students will: - Have acquired practical skills in the use of a light microscope. - Have an understanding of basic investigative techniques for disease detection in pathology. - Be able to evaluate diseased tissue at the macroscopic and microscopic level. - Have the ability to describe, synthesise and present information on disease pathogenesis. - Transfer problem-solving skills to novel situations related to disease pathogenesis. This unit of study would be appropriate for those who intend to proceed to Honours research, to postgraduate studies such as Medicine or to careers in biomedical areas such as hospital science. Enquiries should be directed to anthea.matsimanis@sydney.edu.au.

Textbooks

Kumar, Abbas and Aster. Robbins Basic Pathology, 9th edition. Saunders. 2012.

PATH3X11 and PATH3X12 to be developed for offering in 2019.

Pharmacology

Study in the Discipline of Pharmacology, School of Medical Sciences, is offered by the Sydney Medical School. Units of study in this major are available at standard and advanced level.

About the major

Pharmacology is the study of the properties and biological actions of drugs and chemicals and the key role they play in the prevention and treatment of human diseases. A drug is any agent, either biological or chemical, that modifies the function of living tissues. Increasingly, doctors rely on drugs not only to cure disease, for example antibiotics and infections, but also to prevent diseases, such as lipid lowering drugs in the prevention of heart disease. Pharmacologists search for and identify new drugs and new drug targets based on knowledge of the nature of particular diseases, and investigate mechanisms of drug action which may lead to greater understanding of disease processes and therapies.

A major in pharmacology will equip you with a thorough knowledge of the discovery, development and testing of drugs, and its importance to the future of medical research and practice. In this major you will learn about the mechanisms of drug action, drug absorption, distribution, metabolism and elimination, drug activity and chemical structure, the effect of drugs on body systems, the toxic effects of drugs and more.

Requirements for completion

A major in Pharmacology requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)24 credit points of 3000-level core units

A minor in Pharmacology is available and articulates to this major.

First year

Core: BIOL1XX7, CHEM1XX1.

Second year

Core: PCOL2011 (MEDS2002 is available for students enrolled in the Medical Science stream only), PCOL2012.

Third year

Core: PCOL3X11, PCOL3X12, PCOL3X21, PCOL3X22.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Pharmacology: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

Vanessa Gysbers
E vanessa.gysbers@sydney.edu.au

T +61 2 9351 6725

Address:
The Discipline of Pharmacology
Molecular Bioscience Building G08
Corner Maze Cros and Butlin Ave
University of Sydney NSW 2006

Professor Robert Vandenberg
T +61 2 9351 6734
E robert.vandenberg@sydney.edu.au

Dr Tina Hinton
T +61 2 9351 6954
E tina.hinton@sydney.edu.au

Learning Outcomes

Students who graduate from Pharmacology will be able to:

1. Describe the physiological and pathophysiological processes in normal and diseased cells and tissues
2. Explain drug mechanism of action in relation to drug and target structure and pathophysiological processes
3. Explain structure-activity relationships and the primciples underlying drug design
4. Describe and critically evaluate pharmacology and toxicology research methods and their role in obtaining knowledge about pharmacology and toxicology and translating this to practice
5. Outline the processes involved in drug development, regulation and monitoring
6. Explain how drugs are absorbed, distributed, metabolised and excreted
7. Apply your understanding of drug targets and binding, and drug absorption, distribution and elimination, to predict and explain the therapeutic effects, side effects and toxic effects of drugs
8. Design and conduct laboratory and virtual pharmacology and toxicology experiments
9. Collect, analyse, interpret and critique data derived from pharmacology and toxicology experiments
10. Communicate experimental findings and their implications
11. Demonstrate proficiency in the use of research software and databases
12. Apply principles of drug mechanism of action, absorption, distribution and elimination to experimentation to predict drug effects
13. Describe and apply assays used in drug discovery and development and the information they provide about drug-target binding and activity
14. Communicate effectively with peers through discussion and debate, informally and formally, in small and large group settings
15. Apply pharmacology and toxicology knowledge to real world problems and contribute to public debate and discourse on safety, efficacy and risks associated with drugs and xenobiotics
16. Use scientific databases to search for and identify literature relevant to current pharmacology and toxicology topics, course material and experiments
17. Integrate pharmacological and toxicological information from many sources to coherently and critically appraise available pharmacology and toxicology knowledge and resolve contemporary problems
18. Communicate effectively using a range of modes (written, oral, visual etc.) for a variety of purposes and audiences
19. Critically analyse the research literature for reliability and relevance of information
20. Consider and apply ethical and cultural reasoning important to pharmacology and toxicology
21. Be accountable for your own learning by being an independent, self-directed learner
22. Demonstrate the capacity for self reflection as well as reflection on the relevance of pharmacology and toxicology to society
23. Demonstrate effective teamwork skills through collaborative learning
24. Explain the difference between legitimate cooperation and plagiarism, and demonstrate academic integrity.

Pharmacology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PHARMACOLOGY			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Pharmacology major			
A major in Pharmacology requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 24 credit points of 3000-level core units			
Pharmacology minor			
A minor in Pharmacology requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
2000-level units of study			
Core			
PCOL2011 **Pharmacology Fundamentals**	6	**A** BIOL1XXX or MBLG1XX1 **P** 6cp from CHEM1XXX **N** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PCOL2012 **Pharmacology: Drugs and People**	6	**A** (BIOL1XXX or MBLG1XX1) and PCOL2011 **P** 6cp from CHEM1XXX **N** PCOL2555	Semester 2
MEDS2002 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Major core			
PCOL3011 **Toxicology**	6	**P** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **N** PCOL3911	Semester 1
PCOL3911 **Toxicology (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **N** PCOL3011	Semester 1
PCOL3012 **Drug Design and Development**	6	**P** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **N** PCOL3912	Semester 1
PCOL3912 **Drug Design and Development (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **N** PCOL3012	Semester 1
PCOL3021 **Drug Therapy**	6	**P** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **N** PCOL3921	Semester 2
PCOL3921 **Drug Therapy (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] **N** PCOL3021	Semester 2
PCOL3022 **Neuropharmacology**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **N** PCOL3922	Semester 2
PCOL3922 **Neuropharmacology (Advanced)**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **P** An annual average mark of 70 or above in the previous year **N** PCOL3022	Semester 2
Minor selective			
PCOL3011 **Toxicology**	6	**P** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **N** PCOL3911	Semester 1
PCOL3911 **Toxicology (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **N** PCOL3011	Semester 1
PCOL3012 **Drug Design and Development**	6	**P** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **N** PCOL3912	Semester 1
PCOL3912 **Drug Design and Development (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **N** PCOL3012	Semester 1
PCOL3021 **Drug Therapy**	6	**P** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **N** PCOL3921	Semester 2
PCOL3921 **Drug Therapy (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] **N** PCOL3021	Semester 2
PCOL3022 **Neuropharmacology**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **N** PCOL3922	Semester 2
PCOL3922 **Neuropharmacology (Advanced)**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **P** An annual average mark of 70 or above in the previous year **N** PCOL3022	Semester 2

Pharmacology

PHARMACOLOGY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Pharmacology major

A major in Pharmacology requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 24 credit points of 3000-level core units

Pharmacology minor

A minor in Pharmacology requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

2000-level units of study

Core

PCOL2011
Pharmacology Fundamentals

Credit points: 6 **Teacher/Coordinator:** Dr Hilary Lloyd **Session:** Semester 1 **Classes:** Lectures (2 x1 hr per week); wet and dry labs (5 x4 hrs), data anaylsis tutorials (2 x 2 hrs); workshops (6 x 2 hrs) **Prerequisites:** 6cp from CHEM1XXX **Prohibitions:** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XXX or MBLG1XX1 **Assessment:** In-semester (40%), which consists of 4 x on-line quizzes, 2 x lab reports, 3 x research topics, 1 x oral presentation, end-of-semester examination (60%), which consists of multiple choice and short answer questions **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides the fundamental grounding in four basic areas in Pharmacology: (1) principles of drug action (2) pharmacokinetics and drug metabolism (3) experimental design and autonomic pharmacology, and (4) drug design. The delivery of material involves lectures, practicals, computer-aided learning and problem-based workshops. Practical classes provide students with the opportunity of acquiring technical experience and teamwork skills. Problem-based workshops are based on real-life scenarios of drug use in the community. These workshops require students to integrate information obtained in lectures in order to provide solutions to the problems. Online quizzes accompany each module and are to encourage continued learning throughout the semester.

Textbooks

Rang and Dale's Pharmacology, 8th Edition. H. P. Rang, J. M. Ritter, R. J. Flower, and G. Henderson, (Elsevier 2016). Medical Pharmacology at a Glance, 7th edn M.J. Neal: (Blackwell Scientific Publications, 2012).

PCOL2012
Pharmacology: Drugs and People

Credit points: 6 **Teacher/Coordinator:** Dr Hilary Lloyd **Session:** Semester 2 **Classes:** Lectures (2x1 hr per week); wet and dry labs (5 x 4 hrs), data analysis tutorials (2 x 2 hrs); workshops (6 x 2 hrs) **Prerequisites:** 6cp from CHEM1XXX **Prohibitions:** PCOL2555 **Assumed knowledge:** (BIOL1XXX or MBLG1XX1) and PCOL2011 **Assessment:** In-semester (40%), which consists of 4 x on-line quizzes, 2 x lab reports, 3 x research topics, 1 x oral presentation, end-of-semester examination (60%), which consists of multiple choice and short answer questions **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines four important areas of Pharmacology: (1) Principles of drug action in the nervous system; (2) Drug abuse, addiction and analgesia; (3) Drug treatment of allergies and GI disorders; (4) Introduction to drug discovery and development. The delivery of material involves lectures, practicals, computer-aided learning and problem-based workshops. Practical classes provide students with the opportunity of acquiring technical experience and teamwork skills. Problem-based workshops are based on real-life scenarios of drug use in the community. These workshops require students to apply information obtained in lectures and readings in order to 'solve' the problems. Workshop activities will include oral presentations.

Textbooks

Rang and Dale's Pharmacology, 8th Edition. H. P. Rang, J. M. Ritter, R. J. Flower, and G. Henderson, (Elsevier 2015). Medical Pharmacology at a Glance, 7th edn M.J. Neal: (Blackwell Scientific Publications, 2012).

MEDS2002 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Major core

PCOL3011
Toxicology

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every 2 weeks and two practical sessions each 3 hours in length. **Prerequisites:** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **Prohibitions:** PCOL3911 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the discipline of toxicology. The study of toxicology is central to the assessment of drug safety in drug development and in the explanation of toxicology associated with registered drugs (adverse drug reactions) and drug-drug interactions. These issues as well as the pharmacogenetic basis of adverse reactions will be considered. Environmental toxicology, particularly toxic reactions to environmental agents such as asbestos and pesticides, and target organ toxicology (lung, liver, CNS) are also covered. The diverse world of plants and animal toxins will also be explored. As a final consequence of exposure to many toxicants, the biology and causes of cancer are discussed. As part of the unit students are introduced to basic ideas about the collection and analysis of data from human and animal populations, both in the structured situation of clinical trials, forensic problems and in analysis of epidemiological data.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 2 ed. McGraw Hill. 2010, or, by the same authors: Toxicology: The Basic Science of Poisons. 7 ed. McGraw Hill. 2008.

PCOL3911
Toxicology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every second week. and two practical sessions each 3 hours in length **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **Prohibitions:** PCOL3011 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3011. Students will be set special advanced assignments and additional practical data management activities related to the material covered in lectures and practical work. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 3rd ed. McGraw Hill. 2015.. or, by the same authors: Toxicology: The Basic Science of Poisons. 8th ed. McGraw Hill. 2013.

PCOL3012
Drug Design and Development

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **Prohibitions:** PCOL3912 **Assessment:** One 2 hour exam, class and online quizzes, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the field of medicinal chemistry associated with drug design and development. The course covers the fundamental aspects of drug discovery and development with reference to the essentials of chemistry and illustrates drug development with examples that include neuraminidase inhibitors and angiotensin converting enzyme inhibitors. The role of computers in drug design is emphasised by classwork and assignments on molecular modelling and structure-activity relationships. The course also extends to a section on the design of diverse pharmacological agents which include compounds for imaging by positron emission tomography (PET), and kinase inhibitors.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

PCOL3912
Drug Design and Development (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **Prohibitions:** PCOL3012 **Assessment:** One 2 hour exam, in class and online quizzes, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3012. Students will be set special advanced assignments related to the material covered in core areas. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

PCOL3021
Drug Therapy

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, three 2 hour tutorials, three 3 hour practicals, elective project (equivalent to four 3 hour practicals) **Prerequisites:** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **Prohibitions:** PCOL3921 **Assessment:** One 2 hour exam, in lecture tests, practical assignment and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study extends on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of the scientific basis of current and novel approaches to pharmacological treatment for major health challenges of the 21st century. Lecture topics, tutorials and laboratory sessions cover drug treatment of arthritis, cardiovascular disorders, cancer, diabetes and protein misfolding disorders. New approaches to the development of next-generation targeted drugs are also introduced. As part of this course all students will extend the practical skills in understanding scientific literature, statistical analysis, critical problem solving and analytical thinking. Each student will conduct a capstone elective project (laboratory or literature-based) in applied pharmacology supervised by academic members of the department.

Textbooks

Rang and Dale's Pharmacology, 7th edn; Drs. Humphrey P. Rang, Maureen M. Dale, James M. Ritter, Rod Flower, and Graeme Henderson (Churchill Livingstone).

PCOL3921
Drug Therapy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, three 2 hour tutorials-advanced material, three 3 hour practicals, elective project (equivalent to four 3 hour practicals, preference given for laboratory-based project). **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] **Prohibitions:** PCOL3021 **Assessment:** One 2 hour exam, two lecture tests, practical assignment and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the same lecture series as PCOL3021. The tutorials and practical sessions will extend the work provided in PCOL321 to challenge deeper learning in the effect of drug therapy on pathophysiology of chronic diseases.

Textbooks

Rang and Dale's Pharmacology, 7th edn; Drs. Humphrey P. Rang, Maureen M. Dale, James M. Ritter, Rod Flower, and Graeme Henderson (Churchill Livingstone).

PCOL3022
Neuropharmacology

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prohibitions:** PCOL3922 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

PCOL3922
Neuropharmacology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prerequisites:** An annual average mark of 70 or above in the previous year **Prohibitions:** PCOL3022 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

Minor selective

PCOL3011
Toxicology

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every 2 weeks and two practical sessions each 3 hours in length. **Prerequisites:** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **Prohibitions:** PCOL3911 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the discipline of toxicology. The study of toxicology is central to the assessment of drug safety in drug development and in the explanation of toxicology associated with registered drugs (adverse drug reactions) and drug-drug interactions. These issues as well as the pharmacogenetic basis of adverse reactions will be considered. Environmental toxicology, particularly toxic reactions to environmental agents such as asbestos and pesticides, and target organ toxicology (lung, liver, CNS) are also covered. The diverse world of plants and animal toxins will also be explored. As a final consequence of exposure to many toxicants, the biology and causes of cancer are discussed. As part of the unit students are introduced to basic ideas about the collection and analysis of data from human and animal populations, both in the structured situation of clinical trials, forensic problems and in analysis of epidemiological data.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 2 ed. McGraw Hill. 2010, or, by the same authors: Toxicology: The Basic Science of Poisons. 7 ed. McGraw Hill. 2008.

PCOL3911
Toxicology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every second week. and two practical sessions each 3 hours in length **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **Prohibitions:** PCOL3011 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3011. Students will be set special advanced assignments and additional practical data management activities related to the material covered in lectures and practical work. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 3rd ed. McGraw Hill. 2015.. or, by the same authors: Toxicology: The Basic Science of Poisons. 8th ed. McGraw Hill. 2013.

PCOL3012
Drug Design and Development

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **Prohibitions:** PCOL3912 **Assessment:** One 2 hour exam, class and online quizzes, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the field of medicinal chemistry associated with drug design and development. The course covers the fundamental aspects of drug discovery and development with reference to the essentials of chemistry and illustrates drug development with examples that include neuraminidase inhibitors and angiotensin converting enzyme inhibitors. The role of computers in drug design is emphasised by classwork and assignments on molecular modelling and structure-activity relationships. The course also extends to a section on the design of diverse pharmacological agents which include compounds for imaging by positron emission tomography (PET), and kinase inhibitors.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

PCOL3912
Drug Design and Development (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **Prohibitions:** PCOL3012 **Assessment:** One 2 hour exam, in class and online quizzes, assignments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3012. Students will be set special advanced assignments related to the material covered in core areas. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

PCOL3021
Drug Therapy

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, three 2 hour tutorials, three 3 hour practicals, elective project (equivalent to four 3 hour practicals) **Prerequisites:** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **Prohibitions:** PCOL3921 **Assessment:** One 2 hour exam, in lecture tests, practical assignment and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study extends on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of the scientific basis of current and novel approaches to pharmacological treatment for major health challenges of the 21st century. Lecture topics, tutorials and laboratory sessions cover drug treatment of arthritis, cardiovascular disorders, cancer, diabetes and protein misfolding disorders. New approaches to the development of next-generation targeted drugs are also introduced. As part of this course all students will extend the practical skills in understanding scientific literature, statistical analysis, critical problem solving and analytical thinking. Each student will conduct a capstone elective project (laboratory or literature-based) in applied pharmacology supervised by academic members of the department.

Textbooks

Rang and Dale's Pharmacology, 7th edn; Drs. Humphrey P. Rang, Maureen M. Dale, James M. Ritter, Rod Flower, and Graeme Henderson (Churchill Livingstone).

PCOL3921
Drug Therapy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, three 2 hour tutorials-advanced material, three 3 hour practicals, elective project (equivalent to four 3 hour practicals, preference given for laboratory-based project). **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] **Prohibitions:** PCOL3021 **Assessment:** One 2 hour exam, two lecture tests, practical assignment and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the same lecture series as PCOL3021. The tutorials and practical sessions will extend the work provided in PCOL321 to challenge deeper learning in the effect of drug therapy on pathophysiology of chronic diseases.

Textbooks

Rang and Dale's Pharmacology, 7th edn; Drs. Humphrey P. Rang, Maureen M. Dale, James M. Ritter, Rod Flower, and Graeme Henderson (Churchill Livingstone).

PCOL3022
Neuropharmacology

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prohibitions:** PCOL3922 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

PCOL3922
Neuropharmacology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prerequisites:** An annual average mark of 70 or above in the previous year **Prohibitions:** PCOL3022 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

Physics

The School of Physics is part of the Faculty of Science. Units of study in this major are available at mainstream and advanced level.

About the major

Physics is the basis of most of the sciences. Techniques developed by physicists are used across the sciences, e.g, nuclear magnetic resonance spectroscopy, radio-carbon dating, medical resonance imaging, nuclear medicine, atomic absorption spectroscopy and electron microscopy.

Physics is a generalist major that, instead of preparing you for a narrow career path in just one area, allows you great freedom of choice in your ultimate employment. This may appeal to students who have not yet committed themselves to one career choice. Skills acquired during a Physics major, such as problem solving, information handling, critical reasoning, logical thought, clear communication, experimentation, and use of computers as an analysis tool are much in demand in many fields of employment. You may end up as a professional physicist, but equally these skills are valued for a job in medicine, communications, manufacturing, teaching, journalism, public service, management, finance, and many more.

Requirements for completion

A major in Physics requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)18 credit points of 3000-level core units
(iv)6 credit points of 3000-level selective units

A minor in Physics is available and is a subset of the major.

First year

The 1000-level Physics units of study are designed to give students from all backgrounds an introduction to the discipline of Physics. They are equally valuable as a self-contained introductory study of Physics for students who are intending to major in other disciplines, and as a solid foundation for further study, possibly leading to a major or minor in Physics.

Study of 1000-level Physics involves choosing 12 credit points of units comprising one unit in Semester 1 and one unit in Semester 2. For students who have a background in Physics at school, choices in Semester 1 are PHYS1001 or PHYS1901 or PHYS1903, our mainstream, advanced, or SSP units respectively. PHYS1002 is our Semester 1 unit for students without a background in secondary-level Physics. In Semester 2, mainstream students can choose between PHYS1003 or PHYS1004, emphasising applications of Physics to technology or the life sciences, respectively. High achieving students should choose between PHYS1902 or PHYS1904, our advanced or SSP units.

Physics also offers elective 1000-level units in Semester 2. PHYS1500 Astronomy and COSC1003/1903 Computational Science are provided to broaden the student experience but are not required for continuing into second year Physics units. These are available as elective units in Table S, the Shared Pool of units for Undergraduate Degrees.

Second year

Physics has much to offer beyond first year. The School of Physics offers seven distinct units of 2000-level Physics.

To major in Physics, a student must complete PHYS2011 (a mainstream unit) or PHYS2911 (an advanced unit) in Semester 1, and PHYS2012 (mainstream) or PHYS2912 (advanced) in Semester 2.

For students intending to major in Physics, we also strongly recommend the second semester units PHYS2013 (mainstream) or PHYS2913 (advanced). In addition we offer the unit PHYS2213 for Electrical Engineers. These are available as elective units in Table S, the Shared Pool of units for Undergraduate Degrees.

Students intending to complete a major or a minor in Physics should also study MATH2021/2921 in the second year of their degree.

Third year

Third year Physics completes a major in Physics, rounding out a student's knowledge in the core subjects (electromagnetism, quantum mechanics, and statistical mechanics), and providing additional coverage of a range of topics (astrophysics, computational physics, condensed matter physics, high energy physics, optics, plasma physics). From 2019 the third year includes a disciplinary project and an interdisciplinary experience.

The core mainstream/advanced units from 2019 are PHYS3050/PHYS3950 in Semester 1 and PHYS3053/PHYS3953 in Semester 2. The other required unit for a major is the project unit PHYS3051/PHYS3951, which is offered in Semester 1 or Semester 2. In addition there are two selective units (PHYS3052/PHYS3952 and PHYS3054/PHYS3954), offered in Semesters 1 and 2 respectively.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area such as Physics at 4000-level. That 24 credit points must include a project unit of study worth at least 12 credit points.

24 credit points of advanced study coursework units in Physics will be available in 2020.

Honours
Requirements for Honours in Physics: completion of 24 credit points of project work and 24 credit points of coursework in nominated units, of which 18 credit points must be Physics units. Note that the combined Bachelor of Science/Bachelor of Advanced Studies requires two majors (one of which will be Physics) that should be completed before commencing Honours.

Honours units of study will be available in 2020.

Contact and further information

Address:
School of Physics
Physics Office, Room 210, Building A28
University of Sydney NSW 2006

Physics Student Services
E physics.studentservices@sydney.edu.au
T +61 2 9351 3037

Associate Professor Michael Wheatland
E michael.wheatland@sydney.edu.au
T +61 2 9351 5965

Learning Outcomes

1. Demonstrate a coherent understanding of the nature of Physics by:

- Articulating how Physics uses observations of relationships between measurable quantities to create conceptual frameworks which can be used to explain, interpret and predict other observations.
- Identifying the role of fundamental Physics concepts in a variety of different contexts.
- Explaining the role and relevance of Physics in society and the development and application of technology.

2. Exhibit well-developed depth and breadth of scientific knowledge in Physics and in the related disciplinary area of mathematics.

3. Critically analyse physical situations by:

- Gathering, documenting, organising, synthesising and critically evaluating information from a range of sources, both scientific and from the wider community.
- Designing, planning, carrying out and refining a Physics experiment or investigation.
- Selecting and critically evaluating practical, computational and/or theoretical techniques or tools in order to conduct an investigation.
- Applying appropriate Physics concepts to the interpretation of experimental or observational data and the drawing of conclusions from that data.

4. Be effective communicators of Physics by:

- Communicating Physics data, results and analysis, to a range of audiences, for a range of purposes, and using a variety of modes.
- Understanding and interpreting arguments or opinions based on Physics, presented by others.

5. Be accountable for their own learning and scientific work by:

- Being independent and self-directed learners.
- Working effectively, responsibly and safely in an individual or team context.
- Demonstrating an ability to manage a project based on applications of physical principles.
- Exhibiting intellectual integrity and practising ethical conduct.

Physics

PHYSICS

Advanced coursework and projects will be available in 2020 for students who complete this major.

Physics major

A major in Physics requires 48 credit points from this table including:

(i) 12 credit points of 1000-level core units

(ii) 12 credit points of 2000-level core units

(iii) 18 credit points of 3000-level core units

(iv) 6 credit points of 3000-level selective units

Physics minor

A minor in Physics requires 36 credit points from this table including:

(i) 12 credit points of 1000-level core units

(ii) 12 credit points of 2000-level core units

(iii)12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics or PHYS1003 or PHYS1004 or PHYS1902 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **N** PHYS1002 or PHYS1901 or EDUH1017 or PHYS1903	Semester 1
PHYS1002 **Physics 1 (Fundamentals)**	6	**A** Students are encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **N** PHYS1001 or PHYS1901 or EDUH1017 or PHYS1903	Semester 1
PHYS1901 **Physics 1A (Advanced)**	6	**A** (85 or above in HSC Physics or equivalent) OR (75 or above in one of PHYS1003 or PHYS1004) OR (PHYS1902 or PHYS1904). Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **N** PHYS1001 or PHYS1002 or EDUH1017 or PHYS1903 *Note: Department permission required for enrolment*	Semester 1
PHYS1903 **Physics 1A (Special Studies Program)**	6	**A** [92 or above in HSC Physics (or equivalent)] OR [80 or above in one of PHYS1904 or PHYS1902]. Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **N** PHYS1001 or PHYS1002 or EDUH1017 or PHYS1901 *Note: Department permission required for enrolment*	Semester 1
PHYS1003 **Physics 1 (Technological)**	6	**A** HSC Physics or PHYS1001 or PHYS1002 or PHYS1901 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **C** Recommended Co-requisites: (MATH1003 or MATH1903) and (MATH1005 or MATH1905). **N** PHYS1004 or PHYS1902 or PHYS1904 *It is recommended that PHYS1001 or PHYS1002 or PHYS1901 be completed before this unit*	Semester 2
PHYS1004 **Physics 1 (Environmental and Life Science)**	6	**A** HSC Physics or PHYS1001 or PHYS1002 or PHYS1901 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **N** PHYS1003 or PHYS1902 or PHYS1904 *It is recommended that PHYS1001 or PHYS1002 or PHYS1901 be completed before this unit*	Semester 2
PHYS1902 **Physics 1B (Advanced)**	6	**A** (85 or above in HSC Physics or equivalent) OR (75 or above in one of PHYS1001 or PHYS1002) OR (PHYS1901 or PHYS1903). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **C** Recommended Co-requisites: (MATH1003 or MATH1903) and (MATH1005 or MATH1905) **N** PHYS1003 or PHYS1004 or PHYS1904 *Note: Department permission required for enrolment*	Semester 2
PHYS1904 **Physics 1B (Special Studies Program)**	6	**A** 75 or above in PHYS1903 or 85 or above in PHYS1901. Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **N** PHYS1003 or PHYS1004 or PHYS1902 *Note: Department permission required for enrolment*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
2000-level units of study			
Core			
PHYS2011 **Physics 2A**	6	**A** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **P** (PHYS1901 or PHYS1001 or PHYS1002 or PHYS1903) and (PHYS1902 or PHYS1003 or PHYS1004 or PHYS1904) **N** PHYS2911 or PHYS2213	Semester 1
PHYS2911 **Physics 2A (Advanced)**	6	**A** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **P** 65 or above in (PHYS1901 or PHYS1001 or PHYS1002 or PHYS1903) and 65 or above in (PHYS1902 or PHYS1003 or PHYS1004 or PHYS1904) **N** PHYS2011 or PHYS2213	Semester 1
PHYS2012 **Physics 2B**	6	**A** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **P** (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **N** PHYS2912 or PHYS2213	Semester 2
PHYS2912 **Physics 2B (Advanced)**	6	**A** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **P** 65 or above in (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and 65 or above in (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **N** PHYS2012 or PHYS2213	Semester 2
3000-level units of study			
Major core			
PHYS3X51, PHYS3X50 and PHYS3X53 to be developed for offering in 2019.			
Major selective			
PHYS3X52 and PHYS3X54 to be developed for offering in 2019.			
Minor selective			
PHYS3X50 and PHYS3X53 to be developed for offering in 2019.			

Physics

PHYSICS

Advanced coursework and projects will be available in 2020 for students who complete this major.

Physics major

A major in Physics requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units

Physics minor

A minor in Physics requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii)12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

PHYS1001
Physics 1 (Regular)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 1 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 9 weeks and one 1-hour tutorial per week. **Prohibitions:** PHYS1002 or PHYS1901 or EDUH1017 or PHYS1903 **Assumed knowledge:** HSC Physics or PHYS1003 or PHYS1004 or PHYS1902 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **Assessment:** 3 hour exam plus laboratories, assignments and mid-semester tests (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is for students who gained 65 marks or better in HSC Physics or equivalent. The lecture series contains three modules on the topics of mechanics, thermal physics, and oscillations and waves.

Textbooks

Young and Freedman. University Physics with Modern Physics, Global Edition. 14th edition, Pearsons 2015. Course lab manual.

PHYS1002
Physics 1 (Fundamentals)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 1 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 9 weeks and one 1-hour tutorial per week. **Prohibitions:** PHYS1001 or PHYS1901 or EDUH1017 or PHYS1903 **Assumed knowledge:** Students are encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **Assessment:** 3 hour exam plus laboratories, assignments and mid-semester tests (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed for students who have not studied Physics previously or scored below 65 in HSC Physics. The lecture series contains modules on the language of physics, mechanics, and oscillations and waves.

Textbooks

College Physics: A Strategic Approach by Knight, Jones and Field, 3rd edition. Pearsons 2014. Course lab manual.

PHYS1901
Physics 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 1 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 9 weeks and one 1-hour tutorial per week. **Prohibitions:** PHYS1001 or PHYS1002 or EDUH1017 or PHYS1903 **Assumed knowledge:** (85 or above in HSC Physics or equivalent) OR (75 or above in one of PHYS1003 or PHYS1004) OR (PHYS1902 or PHYS1904). Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **Assessment:** 3-hour exam plus laboratories, assignments and mid-semester tests (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit of study is intended for students who have a strong background in Physics and an interest in studying more advanced topics. It proceeds faster than Physics 1 (Regular), covering further and more difficult material. The lecture series contains modules on the topics of mechanics, thermal physics, oscillations and waves and chaos. The laboratory work also provides an introduction to computational physics using chaos theory as the topic of study.

Textbooks

Young and Freedman. University Physics with Modern Physics, Global Edition. 14th edition, Pearsons 2015. Course lab manual.

PHYS1903
Physics 1A (Special Studies Program)

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1hr lectures per week, 1x1hr tutorial per week **Prohibitions:** PHYS1001 or PHYS1002 or EDUH1017 or PHYS1901 **Assumed knowledge:** [92 or above in HSC Physics (or equivalent)] OR [80 or above in one of PHYS1904 or PHYS1902]. Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **Assessment:** 3hr exam plus laboratories, assignments, mid-semester tests and end-of-semester lab project presentation **Practical field work:** 1x3hr laboratory for 9 weeks, including short project-based exercises **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The unit is intended for high achieving students who have a strong background in Physics and an interest in studying more advanced topics. It shares lecture and tutorial classes with PHYS1901, with modules on the topics of mechanics, thermal physics oscillations and wave and chaos. However, it features a laboratory component that is very different, with project-based exercises and a more open-ended research format than other lab classes.

Textbooks

Young and Freedman, University Physics, 14th edition with Modern Physics, Global Edition, Pearson 2015. Course lab manual

PHYS1003
Physics 1 (Technological)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 2 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 10 weeks, one 1-hour tutorial per week. **Corequisites:** Recommended Co-requisites: (MATH1003 or MATH1903) and (MATH1005 or MATH1905). **Prohibitions:** PHYS1004 or PHYS1902 or PHYS1904 **Assumed knowledge:** HSC Physics or PHYS1001 or PHYS1002 or PHYS1901 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **Assessment:** 3 hour exam plus laboratories, tutorials, and assignments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: It is recommended that PHYS1001 or PHYS1002 or PHYS1901 be completed before this unit

This unit of study is designed for students majoring in physical and engineering sciences and emphasis is placed on applications of physical principles to the technological world. The lecture series contains modules on the topics of fluids, electromagnetism, and quantum physics.

Textbooks

Young and Freedman. University Physics with Modern Physics, Global Edition. 14th edition, Pearsons 2015. Course lab manual.

PHYS1004
Physics 1 (Environmental and Life Science)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 2 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 10 weeks and one 1-hour tutorial per week. **Prohibitions:** PHYS1003 or PHYS1902 or PHYS1904 **Assumed knowledge:** HSC Physics or PHYS1001 or PHYS1002 or PHYS1901 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **Assessment:** 3-hour exam plus laboratories and assignments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: It is recommended that PHYS1001 or PHYS1002 or PHYS1901 be completed before this unit

This unit of study has been designed specifically for students interested in further study in environmental and life sciences. The lecture series contains modules on the topics of properties of matter, electromagnetism, and radiation and its interactions with matter.

Textbooks

College Physics: A Strategic Approach by Knight, Jones and Field, 3rd edition. Pearsons 2014. Course lab manual.

PHYS1902
Physics 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 2 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 10 weeks and one 1-hour tutorial per week. **Corequisites:** Recommended Co-requisites: (MATH1003 or MATH1903) and (MATH1005 or MATH1905) **Prohibitions:** PHYS1003 or PHYS1004 or PHYS1904 **Assumed knowledge:** (85 or above in HSC Physics or equivalent) OR (75 or above in one of PHYS1001 or PHYS1002) OR (PHYS1901 or PHYS1903). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **Assessment:** 3-hour exam plus laboratories, and assignments (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit of study is a continuation of the more advanced treatment of Physics 1A (Advanced). Students who have completed PHYS1001 or PHYS1002 at Distinction level may enrol. It proceeds faster than Physics 1 (Technological), covering further and more difficult material. The lecture series contains modules on the topics of fluids, electricity and magnetism, and quantum physics.

Textbooks

Young and Freedman. University Physics with Modern Physics, Global Edition. 14th edition, Pearsons 2015. Course lab manual.

PHYS1904
Physics 1B (Special Studies Program)

Credit points: 6 **Session:** Semester 2 **Classes:** 3x1hr lectures per week, 1x1hr tutorial per week **Prohibitions:** PHYS1003 or PHYS1004 or PHYS1902 **Assumed knowledge:** 75 or above in PHYS1903 or 85 or above in PHYS1901. Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **Assessment:** 3hr exam plus laboratories, assignments, mid-semester tests and end-of-semester research project report and presentation **Practical field work:** 1x3hr laboratory for 4 weeks and a research project in the other weeks of semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The unit is a continuation for high achieving students of PHYS1904. It shares lecture and tutorial classes with PHYS1902, with modules on the topics of fluids, electricity and magnetism, and quantum physics. The lab component features a research project to be performed with researchers in one of the School's research groups.

Textbooks

Young and Freedman, University Physics, 14th edition with Modern Physics, Global Edition, Pearson 2015. Course lab manual

2000-level units of study

Core

PHYS2011
Physics 2A

Credit points: 6 **Teacher/Coordinator:** Prof Iver Cairns **Session:** Semester 1 **Classes:** Two 1-hour lectures per week for 11 weeks; one 2-hour computational laboratory and one 3-hour experimental laboratory per week for 10 weeks. **Prerequisites:** (PHYS1901 or PHYS1001 or PHYS1002 or PHYS1903) and (PHYS1902 or PHYS1003 or PHYS1004 or PHYS1904) **Prohibitions:** PHYS2911 or PHYS2213 **Assumed knowledge:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **Assessment:** One 2-hour exam, assignments, one 1-hour computational test, practical work, practical report and presentation, computational lab work (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In combination with two semesters of Junior Physics, this unit of study continues a first pass through the major branches of classical and modern physics, providing students with a sound basis for later Physics units or for studies in other areas of science or technology. Hence, this unit suits students continuing with the study of Physics at the Intermediate level, and those wishing to round out their knowledge of physics before continuing in other fields. The modules in this unit of study are: Optics: The wave nature of light, and its interactions with matter; applications including spectroscopy and fibre optics. Thermodynamics: The thermal properties of matter. Computational Physics: In a PC-based computing laboratory students use simulation software to conduct virtual experiments in physics, which illustrate and extend the relevant lectures. Students also gain general skills in the use of computers to solve problems in physics. An introductory session of MATLAB is held in the first three lab sessions for students who are not familiar with programming. Practical: Experimental Physics is taught as a laboratory module and includes experiments in the areas of electrical circuits, nuclear decay and particles, properties of matter, and other topics. Assessment is based on mastery of each attempted experiment. At the end of the semester students prepare a short report on one experiment and make an oral presentation on it.

Textbooks

Young and Freedman, University Physics with Modern Physics Technology Update, 13th edition. with Mastering Physics, Pearsons, 2014.

PHYS2911
Physics 2A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Iver Cairns **Session:** Semester 1 **Classes:** Two 1-hour lectures per week for 11 weeks; one 2-hour computational laboratory and one 3-hour experimental laboratory per week for 10 weeks. **Prerequisites:** 65 or above in (PHYS1901 or PHYS1001 or PHYS1002 or PHYS1903) and 65 or above in (PHYS1902 or PHYS1003 or PHYS1004 or PHYS1904) **Prohibitions:** PHYS2011 or PHYS2213 **Assumed knowledge:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **Assessment:** One 2-hour exam, assignments, one 1-hour computational test, practical work, practical report and presentation, computational lab work (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed for students with a strong interest in Physics. The lecture topics are as for PHYS2011. They are treated in greater depth and with more rigorous attention to derivations than in PHYS2011. The assessment reflects the more challenging nature of the material presented.

Textbooks

Young and Freedman, University Physics with Modern Physics Technology Update, 13th edition. with Mastering Physics, Pearsons, 2014.

PHYS2012
Physics 2B

Credit points: 6 **Teacher/Coordinator:** Prof Iver Cairns **Session:** Semester 2 **Classes:** Three 1-hour lectures per week; one 2-hour computational laboratory per week for 11 weeks. **Prerequisites:** (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **Prohibitions:** PHYS2912 or PHYS2213 **Assumed knowledge:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **Assessment:** One 3-hour exam, assignments, one 1-hour computational test, computational lab work and project, practical work and report (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed for students continuing with the study of Physics at the general Intermediate level, and represents the beginning of a more in-depth study of the main topics of classical and modern physics. The modules in this unit of study are: Quantum Physics: The behaviour of matter and radiation at the microscopic level. Electromagnetic Properties of Matter: Electric and magnetic effects in materials; the combination of electric and magnetic fields to produce light and other electromagnetic waves; the effects of matter on electromagnetic waves. Computational Physics: The computational physics component is similar to that of PHYS2011.

Textbooks

Serway, Moses and Moyer. Modern Physics. 3rd edition. Brooks/Cole. 2005.

PHYS2912

Physics 2B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Iver Cairns **Session:** Semester 2 **Classes:** Three 1-hour lectures per week, one-2 hour computational laboratory per week for 11 weeks. **Prerequisites:** 65 or above in (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and 65 or above in (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **Prohibitions:** PHYS2012 or PHYS2213 **Assumed knowledge:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **Assessment:** One 3-hour exam, assignments, one 1-hour computational test, computational lab work and project, practical work and report (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Refer to PHYS2911 for an overall description of the Advanced Intermediate Physics program. The lecture topics are as for PHYS2012 with some advanced content. Computational Physics: As for PHYS2012, but at a more advanced level.

Textbooks

Young and Freedman, University Physics with Modern Physics Technology Update, 13th edition. with Mastering Physics, Pearsons, 2014.

3000-level units of study

Major core

PHYS3X51, PHYS3X50 and PHYS3X53 to be developed for offering in 2019.

Major selective

PHYS3X52 and PHYS3X54 to be developed for offering in 2019.

Minor selective

PHYS3X50 and PHYS3X53 to be developed for offering in 2019.

Physiology

Study in the Discipline of Physiology, School of Medical Sciences, is offered by Sydney Medical School and is the focus of teaching and research in the physiological sciences at the University of Sydney. Units of study in this major are available at standard and advanced level.

About the major

Physiology is the study of how the human body works and is a core discipline area in medical and life sciences. Physiology plays the central role in the medical sciences, integrating from the molecular and cellular levels through to the whole tissue and organs to understand whole body function. The study of physiology combines the use of examples of common body dysfunctions to enable a broader understanding of both the normal and abnormal functioning of the human body. A major in physiology will give students a thorough understanding of how the body works and the generic skills of data analysis, interpretation and communication they need. These skills may enable physiology graduates to pursue a range of careers in, for example, medicine, allied health, research, biomedical engineering.

Requirements for completion

A major in Physiology requires 48 credit points, consisting of:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level selective units
(iii)12 credit points of 2000-level core units according to the following rules:

- 6 credit points of Physiology core unit and 6 credit points of selective MEDS coded units, or
- 12 credit points of PHSI coded core units

(iv)12 credit points of 3000-level breadth units
(v)12 credit points of 3000-level specialisation units

A minor in Physiology is available and articulates to this major.

First year

CHEM1XX1 and 6 credit points from a selection of: BIOL1XX8 (MEDS1X01 only available to students enrolled in the Medical Science stream), BIOL1XX7.

Second year

PHSI2X06, PHSI2X05 (6 credit points from a selection of: MEDS2001, MEDS2002, MEDS2003, MEDS2004, MEDS2005, only available to students enrolled in the Medical Science stream).

Third year

6 credit points from a selection of: PHSI3X09, PHSI3X10, NEUR3X06 and 6 credit points from a selection of: PHSI3X09, PHSI3X10, NEUR3X06 and 12 credit points from a selection of: NEUR3X03, NEUR3X04, PHSI3X11, PHSI3X12, HSTO3003.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Physiology: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

Addresses:
Sydney Medical School
Edward Ford Building A27
University of Sydney NSW 2006

School of Medical Sciences
Anderson Stuart Building F13
University of Sydney NSW 2006

E yvonne.smythe@sydney.edu.au
T +61 2 9351 2841

Physiology Administration
E enquiries@physiol.usyd.edu.au
T +61 2 9351 3478

Professor Rebecca Mason
E rebeccam@physiol.usyd.edu.au
T +61 2 9351 2561

Learning Outcomes

Students who graduate from Physiology will be able to:

1. Explain the role and basic workings of the major systems of the human body (to be covered in 2nd year)
2. Articulate the methods used in the physiological sciences and be able to explain why current scientific knowledge is both contestable and testable by further inquiry.
3. Explain the role and relevance of physiology research findings to society including the translation to clinical and medical outcomes.
4. Demonstrate the ability to integrate physiological knowledge to knowledge in other disciplinary areas of the biomedical sciences.
5. Collect, synthesize, analyze and critically evaluate physiological data and information from a range of sources.
6. Define a physiological problem, formulate a hypotheses and plan an investigation and, in the process, understand the ethical and regulatory frameworks relevant to Physiological science and academic integrity.
7. Select and apply practical and/or theoretical techniques or tools in order to conduct an investigation in Physiology.
8. Demonstrate creative and innovative approaches to problem solving in the field of physiological research and work effectively, responsibly and safely in individual and collaborative contexts.
9. Communicate observations and experimental findings in Physiology and their implications through a broad variety of media to diverse audiences.
10. Apply tools and practices that will help you in your life-long learning.

Physiology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session

PHYSIOLOGY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Physiology major

A major in Physiology requires 48 credit points from this table including:

(i) 6 credit points of 1000-level core units

(ii) 6 credit points of 1000-level selective units

(iii) 12 credit points of 2000-level core units according to the following rules:

(a)6 credit points of Physiology core unit and 6 credit points of selective MEDS coded units or

(b)12 credit points of PHSI coded core units

(iv) 12 credit points of 3000-level breadth units

(v) 12 credit points of 3000-level specialisation units

Physiology minor

A minor in Physiology requires 36 credit points from this table including:

(i) 6 credit points of 1000-level core units

(ii) 6 credit points of 1000-level selective units

(iii) 12 credit points of 2000-level core units according to the following rules:

(a)6 credit points of Physiology core unit and 6 credit points of selective MEDS coded units or

(b)12 credit points of PHSI coded core units

(iv) 6 credit points of 3000-level breadth units

(v) 6 credit points of 3000-level specialisation units

Units of study

The units of study are listed below.

1000-level units of study

Core

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1

Selective

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			
2000-level units of study			
Core Physiology unit			
MEDS2001 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
Selective MEDS coded units			
MEDS2002, MEDS2003, MEDS2004 and MEDS2005 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
Core PHSI coded units			
PHSI2005 **Integrated Physiology A**	6	**P** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PHSI2905 **Integrated Physiology A (Advanced)**	6	**P** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PHSI2006 **Integrated Physiology B**	6	**P** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2906 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units is highly recommended for progression to Senior Physiology. It is recommended that PHSI2005 is completed before enrolling in PHSI2006.*	Semester 2
PHSI2906 **Integrated Physiology B (Advanced)**	6	**P** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2006 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 2
3000-level units of study			
Breadth units			
PHSI3009 **Frontiers in Cellular Physiology**	6	**P** (PHSI2X05 and PHSI2X06) or (BMED2401 and an additional 12 credit points from BMED240X) **N** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3909 *We strongly recommend that students take both (PHSI3009 or PHSI3909) and (PHSI3010 or PHSI3910) units of study concurrently*	Semester 1
PHSI3909 **Frontiers in Cellular Physiology (Adv)**	6	**P** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **N** PHSI3009, PHSI3005, PHSI3905, PHSI3006, PHSI3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PHSI3010 **Reproduction, Development and Disease**	6	**P** (PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02, BIOL2X29, GEGE2X01)] or [12cp from (BMED2402, BMED2403, BMED2406)] **N** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3910 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PHSI3910 **Reproduction, Development and Disease Adv**	6	**P** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02 or BIOL2X29 or GEGE2X01)] or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **N** PHSI3010, PHSI3005, PHSI3905, PHSI3006, PHSI3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3006 **Neural Information Processing**	6	**P** PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X) **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
NEUR3906 **Neural Information Processing (Advanced)**	6	**P** A mark of 75 or above in [PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X)] **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3006 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
Specialisation units			
NEUR3003 **Cellular and Developmental Neuroscience**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **N** NEUR3903 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3903 **Cellular and Developmental Neurosci. (Adv)**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **P** Annual average mark of 70 or above in the previous year **N** NEUR3003 *Note: Department permission required for enrolment* *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3004 **Integrative Neuroscience**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **N** NEUR3904 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3904 **Integrative Neuroscience (Advanced)**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **P** Annual average mark of 70 or above in the previous year **N** NEUR3004 *Note: Department permission required for enrolment* *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3011 **Frontiers in Whole Body Physiology**	6	**P** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **N** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3911 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3911 **Frontiers in Whole Body Physiology (Adv)**	6	**P** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **N** PHSI3011, PHSI3007, PHSI3907, PHSI3008, PHSI3908 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3012 **Physiology of Disease**	6	**P** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **N** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3912 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3912 **Physiology of Disease (Advanced)**	6	**P** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **N** PHSI3012, PHSI3007, PHSI3907, PHSI3008, PHSI3908 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
HSTO3003 **Cells and Development: Theory**	6	**A** ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Physiology

PHYSIOLOGY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Physiology major

A major in Physiology requires 48 credit points from this table including:(i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units according to the following rules:(a)6 credit points of Physiology core unit and 6 credit points of selective MEDS coded units or(b)12 credit points of PHSI coded core units(iv) 12 credit points of 3000-level breadth units (v) 12 credit points of 3000-level specialisation units

Physiology minor

A minor in Physiology requires 36 credit points from this table including:(i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units according to the following rules:(a)6 credit points of Physiology core unit and 6 credit points of selective MEDS coded units or(b)12 credit points of PHSI coded core units(iv) 6 credit points of 3000-level breadth units(v) 6 credit points of 3000-level specialisation units

Units of study

The units of study are listed below.

1000-level units of study

Core

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Selective

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit

will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks

TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks

TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks

TBA

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks
TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Core Physiology unit

MEDS2001 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

Selective MEDS coded units

MEDS2002, MEDS2003, MEDS2004 and MEDS2005 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

Core PHSI coded units

PHSI2005
Integrated Physiology A

Credit points: 6 **Teacher/Coordinator:** Dr Michael Morris **Session:** Semester 1 **Classes:** Three 1 hour lectures per week. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual written assessments, and quizzes (100%) **Practical field work:** One 3 hour practical or one 3 hour tutorial per week. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study offers an introduction to the basic concepts underpinning physiology, excitable cell (nerve and muscle) physiology, as well as the functions of the nervous system (central processing, and sensory and motor systems). It also incorporates cardiovascular and exercise physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Tutorial sessions develop critical thinking, the integrative nature of physiology, and generic skills in scientific writing and presentation. The practicals and tutorials also emphasise group learning and team work.

Textbooks
Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 7th edition. 2015. ISBN-10: 0321981227; ISBN-13: 978-0321981226 (International Edition)

PHSI2905
Integrated Physiology A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 1 **Classes:** Five 1 hour lectures, one 3 hour practical and one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. Students will also be exempt from all Inquiry-based learning tutorials. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2005 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2005. This unit of study offers a basic introduction to the functions of the nervous system, excitable cell (nerve and muscle) physiology, sensory and motor systems, and central processing. It also incorporates haematology and cardiovascular physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Inquiry-based learning sessions develop critical thinking and generic skills while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks
Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2010. ISBN 10:0-321-1750071; ISBN 13:978-0-321-750075 (International Edition).

PHSI2006
Integrated Physiology B

Credit points: 6 **Teacher/Coordinator:** Dr Bronwyn McAllan **Session:** Semester 2 **Classes:** Three 1 hour lectures per week, and one 3 hour practical or one 3 hour tutorial per week. There will be one 4 hour practical session. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2906 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** Two written exams; group and individual written and oral presentations (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units is highly recommended for progression to Senior Physiology. It is recommended that PHSI2005 is completed before enrolling in PHSI2006.

This unit of study offers a basic introduction to the functions of the remaining body systems: gastrointestinal, respiratory, haematology, endocrine, reproductive and renal. The practical component involves experiments on humans and computer simulations, with an emphasis on hypothesis generation and data analysis. The tutorial sessions develop critical thinking and graduate attributes while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2012. ISBN-10: 0321750071. ISBN-13: 978-0321750075.

PHSI2906
Integrated Physiology B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 2 **Classes:** Three 1 hour lectures per week, and one 3 hour practical and/or one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2006 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2006 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2006. This unit of study gives a basic introduction to the remaining of the body systems: gastrointestinal, respiratory, endocrine, reproductive and renal. The practical component involves simple experiments on humans, isolated tissues, and computer simulations, with an emphasis on hypothesis generation and data analysis. Both oral and written communication skills are emphasised, as well as group learning. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2012. ISBN 10:0-321-750071; ISBN 13:978-0-321-750075 (International Edition).

3000-level units of study

Breadth units

PHSI3009
Frontiers in Cellular Physiology

Credit points: 6 **Teacher/Coordinator:** A/Prof Anuwat Dinudom **Session:** Semester 1 **Classes:** 2 x 1hr/ week lectures and 6 x 2 hr large class tutorials (PBL) per semester **Prerequisites:** (PHSI2X05 and PHSI2X06) or (BMED2401 and an additional 12 credit points from BMED240X) **Prohibitions:** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3909 **Assessment:** four in-class quizzes, one mid-semester exam, one 2hr final exam, two presentations for problem-based learning and 1 practical class report **Practical field work:** 3 x 4 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: We strongly recommend that students take both (PHSI3009 or PHSI3909) and (PHSI3010 or PHSI3910) units of study concurrently

The aim of this unit is to provide students with advanced knowledge of cellular physiology. There will be a detailed exploration of the signals and pathways cells use to detect and respond to environmental changes and cues. Important signalling systems and homeostatic regulators will be discussed in the context of biological processes and human diseases. Problem-based learning sessions will explore these diseases with student-led teaching. Practical classes will explore physiological techniques for investigating cell signalling and the biophysical properties of cells. Large class tutorials will focus on graduate attribute skills development in the context of reinforcing material discussed in the lectures and practical classes. This unit will develop key attributes that are essential for a science graduate as they move forward in their careers.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3909
Frontiers in Cellular Physiology (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Anuwat Dinudom **Session:** Semester 1 **Classes:** 2 x 1hr/ week lectures and 3 x 2 hrs large class tutorials (PBL) per semester **Prerequisites:** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **Prohibitions:** PHSI3009, PHSI3005, PHSI3905, PHSI3006, PHSI3906 **Assessment:** four in-class quizzes, one mid-semester exam, one 2hr final exam, one presentations for problem-based learning and one Advanced research report **Practical field work:** 3 x 4 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of cellular physiology. There will be a detailed exploration of the signals and pathways cells use to detect and respond to environmental changes and cues. Important signalling systems and homeostatic regulators will be discussed in the context of biological processes and human diseases. Problem-based learning sessions will explore these diseases with student-led teaching. Practical classes will explore physiological techiques for investigating cell signalling and biophysical properties of cells. Large class tutorials will focus on graduate attribute skills development in the context of reinforcing material discussed in the lectures and practical classes. This unit will develop key attributes that are essential for science a graduate as they move forward in their careers.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3010
Reproduction, Development and Disease

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 1 **Classes:** 2 x 1hr lectures per week; 1 guest lecture/problem-based learning class introduction/organisation session per week. 2 x 3 hour problem-based learning classes per semester. **Prerequisites:** (PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02, BIOL2X29, GEGE2X01)] or [12cp from (BMED2402, BMED2403, BMED2406)] **Prohibitions:** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3910 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, two problem-solving learning tutorials, 3 practical class reports **Practical field work:** 3 x 3 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of the physiological processes that regulate normal and how these may go awry leading to significant human conditions or even disease. Lectures will focus on; male and female reproductive physiology, endocrinology of reproduction, physiology of fertilisation, cell cycle control and apoptosis, mechanisms of differentiation, gastrulation, cardiovascular development, tissue formation and organogenesis, stem cell biology and the link between developmental processes and cancer. Reprogramming and tissue regeneration will also feature in the lecture content. Problem-based learning will focus on reproductive physiology and regeneration. Practical classes will examine the processes regulating sperm function, embryogenesis and stem cell biology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3910
Reproduction, Development and Disease Adv

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 1 **Classes:** 2 x 1hr lectures per week; 1 guest lecture/problem-based learning class introduction/organisation session per week; 2 x 3 hour stem cell laboratory presentations per semester. **Prerequisites:** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02 or BIOL2X29 or GEGE2X01)] or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **Prohibitions:** PHSI3010, PHSI3005, PHSI3905, PHSI3006, PHSI3906 **Assessment:** one mid-semester MCQ exam, one 2hr final exam,stem cell labortory class (2 presentations), 3 practical class reports **Practical field work:** 4 x 4 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of the physiological processes that regulate normal and how these may go awry leading to significant human conditions or even disease. Lectures will focus on; male and female reproductive physiology, endocrinology of reproduction, physiology of fertilisation, cell cycle control and apoptosis, mechanisms of differentiation, gastrulation, cardiovascular development, tissue formation and organogenesis, stem cell biology and the link between developmental processes and cancer. Reprogramming and tissue regeneration will also feature in the lecture content. . Practical classes will examine the processes regulating sperm function, embryogenesis and stem cell biology. Students enrolling in PHSI3910 complete a separate laboratory class centered on stem cell differentiation to replace the problem-based learning exercises in PHSI3010.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

NEUR3006
Neural Information Processing

Credit points: 6 **Teacher/Coordinator:** A/Prof Bill Phillips **Session:** Semester 1 **Classes:** two lectures, 1 two-hour research paper session (journal club, 8 weeks) **Prerequisites:** PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X) **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3906 **Assessment:** one 2hr exam, 1500w essay, paper session oral presentation and participation marks, one prac report plus prac quizzes **Practical field work:** 1 x 3hour Prac (total of 5 such practical sessions) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit provides an introduction the mechanisms that drive neurons and neural circuits throughout the brain and body. The lectures explore how signal intensity is translated into nerve impulse codes and how this information is again translated through synapses to convey and interpret information about the external world, to control the body and to record information for future use (learning and memory). We also consider how sensory and motor information is integrated through neural circuits in the brain and spinal cord. Practical classes introduce some of the different ways in which the workings of the brain are studied. Each student chooses a journal club that focuses on a specific topic in neuroscience. In the weekly sessions, group members read, present and interpret original research papers, developing a deep understanding of the emerging scientific evidence in the topic area. This senior year unit of study will develop skills in critical analysis, interpretation and communication of new evidence.

Textbooks

Kandel, Schwartz, Jessel, Sigelbaum, Hudspeth. Principles of Neural Science. 5th Ed, Elsevier, NY, 2013

NEUR3906
Neural Information Processing (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dario Protti **Session:** Semester 1 **Classes:** 1 hour lectures per week **Prerequisites:** A mark of 75 or above in [PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X)] **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3006 **Assessment:** One 2hr exam, prac assessment consisting of one group poster presentation and two short MCQ quizzes, one advanced prac report, one written grant proposal (up to 2,000 words) and oral presentation of grant proposal. **Practical field work:** 1 x 3hour Prac (total of 6 such practical sessions) with the mainstream course and 3-4 x 3 hour advanced pracs. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit provides an introduction into the mechanisms that drive neurons and neural circuits throughout the brain and body. The lectures explore how signal intensity is translated into nerve impulse codes and how this information is again translated through synapses to convey and interpret information about the external world, to control the body and to record information for future use. We also consider how sensory and motor information is integrated through neural circuits in the brain and spinal cord. Practical classes introduce some of the different ways in which the workings of the brain are studied. This senior year unit of study will develop skills in critical analysis, interpretation and communication of new evidence.

Textbooks

Kandel, Schwartz, Jessel, Sigelbaum, Hudspeth. Principles of Neural Science. 5th Ed, Elsevier, NY, 2013

Specialisation units

NEUR3003
Cellular and Developmental Neuroscience

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Three 1-hour lectures plus one 1-hour tutorial per week. **Prohibitions:** NEUR3903 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Final exam. Mid-semester exam, Major essay/report, attendance and particpation in assessment of Advanced student presentations (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This second semester unit is designed to introduce students to "cutting edge" issues in the neurosciences. This course is a combination of small lectures on current issues in cellular and developmental neuroscience and a research-based library project. Issues covered in the lecture series will include the role of glial on cerebral blood flow and neural transmission, neurochemistry and psychiatric disorders and the development of central and peripheral nervous systems.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition. Elsevier. 2000.

NEUR3903
Cellular and Developmental Neurosci. (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Three 1-hour lectures and one 2-hour lab session per week. **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3003 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Final exam. Mid-semester exam, Mini-lecture presentation and resources, Attendance at and participation in assessment of advanced student presentations (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit encompasses the material taught in NEUR3003. Advanced students perform a research project and present a mini-lecture on a current topic in neuroscience.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition. Elsevier. 2000.

NEUR3004
Integrative Neuroscience

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** One 1-hour lecture, one 2-hour tutorial per week. **Prohibitions:** NEUR3904 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Mid-semester exam, Final exam, 3 short in-semester assessments/reports, Tutorial participation, attendance and at participation in assessment of Advanced student presentations (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This second semester unit is designed to introduce students to "cutting edge" issues in the neurosciences and to be taken in conjunction with NEUR3003. This course is a combination of small group lectures on current issues in neuroscience, seminar groups and a research-based library project. Seminars will be held on topics including imaging pain, emotions, cortical development and plasticity, colour vision, stroke and hypertension, and long-term regulation of blood pressure.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition.

NEUR3904
Integrative Neuroscience (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Up to one 1-hour lecture, one 2-hour tutorial and one two hour laboratory session per week on average. **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3004 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Mid-semester exam, Final exam, Major essay/report, Tutorial participation, Attendance at and participation in assessment of advanced student presentations (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit encompasses the material taught in NEUR3004. Advanced students perform a research project and present a mini-lecture on a current topic in neuroscience research.

BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition.

PHSI3011
Frontiers in Whole Body Physiology

Credit points: 6 **Teacher/Coordinator:** Prof Phillip Poronnik **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 4 x 2 hr class tutorials per semester (Week 3 and 13) and 2 x 1 hr tutorial preparation session (week 2 and 12), one contcept based learning tutorial 3 x 2 hours **Prerequisites:** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **Prohibitions:** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3911 **Assessment:** one mid-semester exam, one 2hr final exam, two tutorial reports, 3 practical class reports **Practical field work:** 3 x 4 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate homeostasis throughout the whole body with a particular focus not only on the interplay between major organ systems, but also variability amongst individuals. The emphasis in this unit is on recent advances at the frontiers of human physiology. Our current understandings of how we functions will be explored at the molecular, cellular and whole body level. This is detailed fundamental knowledge that is key to understanding the transitions that occur from health to disease. Hands on practical classes will explore the physiology presented in the lectures and tutorial sessions will investigate what 'normal' is in terms of whole body physiology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science; Siverthorn D, Human Physiology: an integrated approach. 7th Edition Pearson.

PHSI3911
Frontiers in Whole Body Physiology (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Phillip Poronnik **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 4 x 2 hr class tutorials per semester (Week 3 and 13) and 2 x 1 hr tutorial preparation session (week 2 and 12), one contcept based learning tutorial 3 x 2 hours **Prerequisites:** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **Prohibitions:** PHSI3011, PHSI3007, PHSI3907, PHSI3008, PHSI3908 **Assessment:** one mid-semester exam, one 2hr final exam, two tutorial reports, 3 practical class reports **Practical field work:** 3 x 4 hr practicals per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate homeostasis throughout the whole body with a particular focus not only on the interplay between major organ systems, but also variability amongst individuals. The emphasis in this unit is on recent advances at the frontiers of human physiology. Our current understandings of how we functions will be explored at the molecular, cellular and whole body level. This is detailed fundamental knowledge that is key to understanding the transitions that occur from health to disease. Hands on practical classes will explore the physiology presented in the lectures and tutorial sessions will investigate what Â¿normalÂ¿ is in terms of whole body physiology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science; Siverthorn D, Human Physiology: an integrated approach. 7th Edition Pearson.

PHSI3012
Physiology of Disease

Credit points: 6 **Teacher/Coordinator:** A/Prof Matthew Naylor **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 12 x 1hr tutorials (weeks 3-5 and 8-10 only), 2 x 6hr practical (weeks 4-5 and 8-9). **Prerequisites:** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **Prohibitions:** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3912 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, two problem-solving learning tutorials, 2 practical class reports **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate normal homeostasis throughout the whole body and how defects in these processes can lead to significant human disease. The emphasis in this unit is on recent advances at the frontiers of human physiology. The processes leading to cancer, cardiovascular and metabolic disease will be explored at the molecular, cellular and whole body level. Problem-based learning will focus on cancer and cardiovascular disease and practical classes will utilise both wet lab and online resources to dissect the processes by which normal physiological processes become aberrant leading to human disease.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3912
Physiology of Disease (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Matthew Naylor **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 2 x 6hr practical (weeks 4-5 and 8-9), Advanced project. **Prerequisites:** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **Prohibitions:** PHSI3012, PHSI3007, PHSI3907, PHSI3008, PHSI3908 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, Advanced project report, 2 practical class reports **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate normal homeostasis throughout the whole body and how defects in these processes can lead to significant human disease. The emphasis in this unit is on recent advances at the frontiers of human physiology. The processes leading to cancer, cardiovascular and metabolic disease will be the specific will be explored at the molecular, cellular and whole body level. Students will undertake an Advanced Project Problem-based learning will focus on cancer and cardiovascular disease and Practical classes will utilise both wet lab and online resources to dissect the processes by which normal physiological processes become aberrant leading to human disease.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

HSTO3003
Cells and Development: Theory

Credit points: 6 **Teacher/Coordinator:** Prof Frank Lovicu **Session:** Semester 2 **Classes:** Four to five 1-hour theory lectures and/or one 1-hour tutorial per week **Assumed knowledge:** ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 2-hour exam, tutorial research papers and Seminar (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The main emphasis of this unit of study concerns the mechanisms that control animal development. Early developmental processes including fertilisation, cleavage, and gastrulation leading to the formation of the primary germ layers and subsequent body organs are described in a range of animals, mainly vertebrates. Stem cells of both embryonic and adult origin will be covered. Emphasis will be placed on the parts played by inductive cell and tissue interactions in cell and tissue differentiation, morphogenesis and pattern formation. This will be studied at both cellular and molecular levels.

Textbooks

Gilbert, SF. Developmental Biology. 11th edition. Sinauer Associates Inc. 2016.

Plant Production

About the major

Increasing the sustainable production of plant food and fibre products over the next 50 years is one of the great global challenges facing the planet. This task is made more complex by climate change, which will place the use of existing plant production systems under question. The plant production system encompasses the basic genetic and physiological regulations on plant growth, the impact on growth of the important abiotic and biotic variables (soil, water, nutrients, disease and pests) and the over-arching influence of management processes. Achieving increased economically and environmentally sustainable plant productivity will be dependent on implementing innovations across all aspects of the production system while more efficiently using resources and reducing negative impacts on the environment.

This major provides training in plant biology (physiology, biochemistry, plant molecular biology and breeding), soil science, plant protection (integrated insect, disease and weed management), sustainable crop management (agronomy), automation and precision agriculture that will enable students to contribute to this globally important transformation.

Requirements for completion

A major in Plant Production requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)12 credit points of 3000-level core units, including 1 interdisciplinary unit and 1 project unit
(iv)12 credit points of 3000-level selective units

A minor in Plant Production is available and articulates to this major.

First year

Core: BIOL1XX6 and BIOL1XX7

Second year

Core: AGRI2001 and BIOL2X31

Third year

AGRI3X05, BIOL3019 and 12 credit points from a selection of: BIOL3020, SOIL3011, AFNR3001, ENVX3001, HORT3005.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Plant Production: completion of 24 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 02 9351 4262

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building F07
University of Sydney NSW 2006
T +61 2 9351 4262

Associate Professor Brett Whelan
E brett.whelan@sydney.edu.au
T +61 2 8627 1132

Learning Outcomes

Students who graduate from Plant Production will be able to:

1. Understand the structure and function of plants.
2. Articulate the major components of the plant metabolic network, its regulation in response to changes in resource availability
3. Use laboratory methods to analyse plants and the effectively communicate experimental findings.
4. Understand how microbes interact with plants at the ecosystem, whole plant, cellular and molecular levels, impacting on nutrient availability and acquisition, growth, yield and disease development
5. Relate the depth of biological understanding to the management requirements for plant production systems.
6. Understand the technical issues that challenge the management of crops and the diversity of specialist information from other relevant disciplines such as soil science and entomology that must be integrated into farming systems
7. Appreciate and analyse some of the most important limitations to plant production and yield in Australia and how those limitations can be minimized or overcome through science-based planning and management practice
8. Integrate this knowledge into a critical understanding of the economic, biophysical, and chemical principles that must be considered in assessing sustainability in plant production.
9. Devise informed management options for the optimization of crop plant productivity and system resilience in Australian agroecosystems.
10. Possess inquiry and communication skills developed through research-based group projects, on-line discussion postings, tutorial discussions and presentations.

Plant Production

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PLANT PRODUCTION			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Plant Production major			
A major in Plant Production requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units, including 1 interdisciplinary unit and 1 project unit (iv) 12 credit points of 3000-level selective units			
Plant Production minor			
A minor in Plant Production requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
BIOL2031 **Plants and Environment**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **N** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2931	Semester 2
BIOL2931 **Plants and Environment (Advanced)**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **P** Annual average mark of at least 70 in previous year **N** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2031	Semester 2
AGRI2001 to be developed for offering in 2019.			
3000-level units of study			
Core			
AGRI3X05 and BIOL3019 to be developed for offering in 2019.			
Selective			
AFNR3001 **Agro-ecosystems in Developing Countries**	6	*Note: Department permission required for enrolment*	Semester 1
ENVX3001 **Environmental GIS**	6	**P** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
HORT3005 **Production Horticulture**	6	**P** (AGEN2001 and AGEN2005) or BIOL2X30 or BIOL2X31 or BIOL2X23 or AGEN2002 or AGRI2001	Semester 1
BIOL3020 and SOIL3011 to be developed for offering in 2019.			

Plant Production

PLANT PRODUCTION

Advanced coursework and projects will be available in 2020 for students who complete this major.

Plant Production major

A major in Plant Production requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 12 credit points of 3000-level core units, including 1 interdisciplinary unit and 1 project unit(iv) 12 credit points of 3000-level selective units

Plant Production minor

A minor in Plant Production requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

2000-level units of study

Core

BIOL2031
Plants and Environment

Credit points: 6 **Teacher/Coordinator:** Prof Brent Kaiser **Session:** Semester 2 **Classes:** Two lectures; one 4-hour practical session on a weekly basis **Prohibitions:** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2931 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quiz (20%), lab assignment (15%), presentation (15%), exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Plants grow across a range of environments, influencing form, function and ultimately reproductive success. Being sessile, plants lack the luxury of seeking an alternative 'stress-free lifestyle' and therefore rely on genetic and physical adaptations to survive and reproduce. To understand how a plant can achieve such flexibility requires knowledge of plant structure and the influence of environmental drivers on plant growth and function. In this unit, you will examine the physiological processes controlling plant growth and reproduction linked to environmental constraints. You will understand the relationship between tissue and cellular structure and their underlying role in physiological and metabolic activities, particularly processes involving light capture, photosynthesis, water regulation, nutrient management and metabolite redistribution. Lectures and interactive practicals will together introduce you to plant processes that underpin life on earth. Experimentation and analysis of plant physiological processes will develop a skill base that will lead to a greater understanding and appreciation of common plant processes. As a component of the Plant Science minor and the Plant Production major, BIOL2031 will provide an important platform to extend your interests in plant science and plant related fields across the curriculum.

Textbooks
Taiz, L. and Zeiger, E. (2010) Plant Physiology, Fifth Edition. Sinauer Associates. Sunderland, MA.

BIOL2931
Plants and Environment (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Brent Kaiser **Session:** Semester 2 **Classes:** Two 1-hour lectures/week; one 4-hour practical/week **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2031 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** On-line quiz (20%), lab assignment (15%), independent project (15%), exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Plants grow across a range of environments, which influence form, function and ultimately reproductive success. Being sessile, plants lack the luxury of seeking an alternative 'stress-free lifestyle' and therefore rely on genetic and physical adaptations to help survive and reproduce. To understand how a plant can achieve such flexibility requires an understanding of plant structure and the influence that environmental drivers have on plant growth and function. In this unit, you will examine the physiological processes controlling plant growth and reproduction linked to environmental constraints. You will understand the relationship between tissue and cellular structure and their underlying role in physiological and metabolic activities, particularly processes involving light capture, photosynthesis, water regulation, nutrient management and metabolite redistribution. Lectures and interactive practicals will together introduce you to plant processes that we commonly depend upon for food production, and plant related materials. Experimentation and analysis of plant physiological processes will develop a skill base that will lead to a greater understanding and appreciation of common plant processes that guide plant growth. As a component of the Plant Science minor, this unit will provide an important platform to extend your interests in plant science and plant-related fields, including ecology, cell biology, genetics, breeding, agriculture, molecular biology, environmental law, education and the arts. The advanced unit has the same overall concepts as BIOL2031 but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in BIOL2931 participate in alternative components, which include a separate lecture and practical stream. The content and nature of these components may vary from year to year.

Textbooks

Resources required by the unit will be provided on the Blackboard learning management page for the unit. Taiz, L. and Zeiger, E. (2010) Plant Physiology, Fifth Edition. Sinauer Associates. Sunderland, MA.

AGRI2001 to be developed for offering in 2019.

3000-level units of study

Core

AGRI3X05 and BIOL3019 to be developed for offering in 2019.

Selective

AFNR3001
Agro-ecosystems in Developing Countries

Credit points: 6 **Teacher/Coordinator:** A/Prof Damien Field **Session:** Semester 1 **Classes:** One 18 days fieldtrip before the start of semester 1, online tutorials **Assessment:** Participation (20%), research topic proposal (20%), oral presentation (20%), major report (40%) **Practical field work:** One 18 day field school **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit provides students with a direct contact with the agricultural reality of a developing country through a fieldtrip. Active learning in the field through contacts with farmers, public servants, cooperatives, private firms and NGOs should then motivate a critical reflection on the constraints to agricultural development in these environments.

The fieldtrip will be organized around central themes (for example, technology adoption, sustainable use of resources, access to credit, land use change) that will be introduced in a short series of seminars (held on main campus ahead of the departure and intended to provide a first introduction to some of the questions that are expected to be addressed in the field) and will constitute the focus of group work once back to main campus.

Although there are no formal prerequisites, the unit is directed to students that have completed most of the second year units in their degrees.

N.B. Department permission required for enrolment. Please note that, in practice, this unit will run prior to the start of semester 1 with all classes and the fieldtrip being scheduled during that period.

ENVX3001
Environmental GIS

Credit points: 6 **Teacher/Coordinator:** A/Prof Inakwu Odeh **Session:** Semester 2 **Classes:** Three-day field trip, (two lectures and two practicals per week) **Prerequisites:** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX **Assessment:** One 15-minute presentation (10%), 3500wd prac report (35%), 1500wd report on trip excursion (15%), 2-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to impart knowledge and skills in spatial analysis and geographical information science (GISc) for decision-making in an environmental context. The lecture material will present several themes: principles of GISc, geospatial data sources and acquisition methods, processing of geospatial data and spatial statistics. Practical exercises will focus on learning geographical information systems (GIS) and how to apply them to land resource assessment, including digital terrain modelling, land-cover assessment, sub-catchment modelling, ecological applications, and soil quality assessment for decisions regarding sustainable land use and management. A three day field excursion during the mid-semester break will involve a day of GPS fieldwork at Arthursleigh University farm and two days in Canberra visiting various government agencies which research and maintain GIS coverages for Australia. By the end of this UoS, students should be able to: differentiate between spatial data and spatial information; source geospatial data from government and private agencies; apply conceptual models of spatial phenomena for practical decision-making in an environmental context; apply critical analysis of situations to apply the concepts of spatial analysis to solving environmental and land resource problems; communicate effectively results of GIS investigations through various means- oral, written and essay formats; and use a major GIS software package such as ArcGIS.

Textbooks

Burrough, P.A. and McDonnell, R.A. 1998. Principles of Geographic Information Systems. Oxford University Press: Oxford.
Clarke, K. C. 2003. Getting Started With Geographic Information Systems. 4th Edition. Prentice Hall: Upper Saddle River, New Jersey.

HORT3005
Production Horticulture

Credit points: 6 **Teacher/Coordinator:** Prof Daniel Tan **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 3-hour practical/workshop per week **Prerequisites:** (AGEN2001 and AGEN2005) or BIOL2X30 or BIOL2X31 or BIOL2X23 or AGEN2002 or AGRI2001 **Assessment:** One 3-hour exam (55%), three assignments (45%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers topics on the production of high quality food from perennial fruit crops, wine grapes, vegetables. It also covers the key aspects of the postharvest handling and quality assurance of fresh produce. At the end of this unit students are expected to have a detailed understanding of these areas of horticultural food production and be able to discuss related literature and the physiological principles underlying the commercial success of these horticultural enterprises. Students will also gain research and enquiry skills through research based practical sessions and assignments.

Textbooks

Recommended reading:
Louis Glowinski (2008) The complete book of fruit growing in Australia.
Lothian Books, Westwood, M.N. (1993) Temperate-zone pomology. Timber Press Inc.
Jackson, J.E (2003) Biology of apples and pears. Cambridge University Press.
Gopinadhan Paliyath et al. (Ed.) (2008) Postharvest biology and technology of fruits, vegetables, and flowers. Oxford: Wiley-Blackwell
Decoteau, D/. R (2000). Vegetable Crops. Upper Saddle River, NJ: Prentice Hall

BIOL3020 and SOIL3011 to be developed for offering in 2019.

Plant Science

Plant Science is an interdisciplinary major offered by the School of Life and Environmental Sciences in the Faculty of Science. Units of study in this major are available at standard and advanced level.

About the minor

Plants are essential to the existence of humans and other animals on our planet. They are the source of many of the things we depend on - the oxygen we breathe, food we eat, fibre for clothing and shelter and chemicals for pharmaceuticals and industry. Plants are a fundamental part of all ecosystems, helping to provide clean water, healthy soils and habitat for wildlife. Studying plant sciences helps us understand how plants survive in their environment and provide these benefits for us.

Plant Science includes fundamental biology, plant biochemistry, plant physiology and development, genetics, ecology, mycology, crop production and protection, and environmental and food chemistry. In addition there are related topics such as soil science, postharvest technology, agronomy and cellular biology in associated teaching programs offered by the Faculty of Science, food and natural resources.

Requirements for completion

A minor in Plant Science requires 36 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)6 credit points of 3000-level core units
(iv)6 credit points of 3000-level selective units

First year

Core: BIOL1XX6 and BIOL1XX7

Second year

Core: BIOL2X30 and BIOL2X31

Third year

BIOL3020 and 6 credit points from a selection of: BIOL3X09 and BIOL3029.

Contact and further information

W sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 02 9351 4262

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building F07
University of Sydney NSW 2006

Associate Professor Brent Kaiser
E brent.kaiser@sydney.edu.au
T +61 2 9351 1831

Learning Outcomes

Students who graduate from Plant Science will be able to:

1. Understand and appreciate plant diversity through taxonomy, anatomy and function
2. Describe, explain and have an integrated understanding of genes, cells, tissues, organisms to systems of plants

3. Understand the anatomical characteristics and physiological processes which together regulate plant growth, development and reproduction
4. Describe the energy management processes which drive plant growth and plant biodiversity
5. Understand how photosynthetic organisms contribute to a healthy planet
6. Understand the involvement and interaction plants have with soil and soil microbes
7. Apply genetic and biotechnologies to advance the genetic composition of plants applications
8. Use current technologies to investigate plant growth and function
9. Develop a perspectives on plant global issues, resource securities and sustainability,
10. Understand the impact of climate change on plant growth and productivity
11. Formulate effective policy to ensure continued plant biodiversity and plant production.

Plant Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PLANT SCIENCE			
Plant Science minor			
The Plant Science minor articulates to the Biology major.			
A minor in Plant Science requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 6 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
BIOL2030 **Botany**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **N** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2930	Semester 1
BIOL2930 **Botany (Advanced)**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **P** Annual average mark of at least 70 in previous year **N** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2030	Semester 1
BIOL2031 **Plants and Environment**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **N** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2931	Semester 2
BIOL2931 **Plants and Environment (Advanced)**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **P** Annual average mark of at least 70 in previous year **N** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2031	Semester 2
3000-level units of study			
Core			
BIOL3020 to be developed for offering in 2019.			
Selective			
BIOL3009 **Terrestrial Field Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3909 or BIOL2009 or BIOL2909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
BIOL3909 **Terrestrial Field Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3009 or BIOL2009 or BIOL2909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered. This unit is not offered from 2019.*	Intensive July
BIOL3029 to be developed for offering in 2019.			

Plant Science

PLANT SCIENCE

Plant Science minor

The Plant Science minor articulates to the Biology major.A minor in Plant Science requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units(iii) 6 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit

will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

2000-level units of study

Core

BIOL2030
Botany

Credit points: 6 **Teacher/Coordinator:** A/Prof Rosanne Quinnell **Session:** Semester 1 **Classes:** Two 1-hour lecture/week; one 3-hour practical/week; a series of five 1-hour tutorial/week in the latter part of the semester **Prohibitions:** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2930 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quizzes (15%), anatomy project report and presentation (20%), practical exam (30%), theory exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are surrounded by plants, and rely on them every day for our wellbeing. Ecologists use botanical knowledge to help manage marine and terrestrial ecosystems, and public health and land management professionals depend on their understanding of plant science to help solve environmental problems and to enhance biosecurity. Botany aims to increase and improve our supply of medicines, foods, and other plant products, and is critical for anyone interested in contributing to the sustainable future of our planet. In this unit, you will explore the origins, diversity, and global significance of plants. You will gain insights into the micro- and macro-evolutionary processes and patterns behind how plants moved from aquatic ecosystems to terrestrial ecosystems. Integrated lectures, practical classes, and extensive online resources will allow you to develop and integrate practical skills and conceptual frame works in plant identification, plant physiology, plant anatomy, and plant morphology. Lectures and practical classes are augmented by self-instructional audio-visual sessions and by small group discussions to foster a sense of self-reliance and collaboration. Successful completion of BIOL2023 will allow you to contribute to a range of disciplines including: ecology, bioinformatics, molecular and cell biology, genetics and biotechnology, environmental law, agriculture, education and the arts.

Textbooks
Evert RF and Eichhorn SE. 2013. Raven: Biology of Plants. 8th Ed. Freeman and Co Publishers. New York. NY.
**School of Life and Env Sci. 201x. Botany and Botany Adv Study guide.
Additional reading:
Attwell BJ, Kriedeman PE, Turnbull CGN. 1999. Plants In Action. Macmillan, South Yarra. (Australian Plant Biology with a good section on ecophysiology).
Judd WS, Campbell CS, Kellogg EA, Stephens PF. 2007. Plant Systematics: a phylogenetic approach. 3rd Ed. Sinauer Associates Inc Massachusetts USA
Pellow B, Henwood M, Carolin R.C., 2009. Flora of the Sydney Region. 5th edition. Sydney University Press.
Simpson, MG. 2010. Plant Systematics Ed 2 Academic press (or Ed 1 2006)
Taiz L. Zeiger E. 2010. Plant Physiology. 5th Ed Sinauer. Sunderland, Mass.
Online learning resources:
Â¿LMS (currently BlackBoard)
Â¿BotanyOnline: http://botany.sydneybiology.org/

BIOL2930
Botany (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Rosanne Quinnell **Session:** Semester 1 **Classes:** Two 1-hour lectures/week; one 3-hour practical/week; a series of five 1-hour tutorial/week in the latter part of the semester **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2030 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quizzes (15%), advanced project report (20%), practical exam (30%), theory exam (35%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are surrounded by plants, and rely on them every day for our wellbeing. Ecologists use botanical knowledge to help manage marine and terrestrial ecosystems, and public health and land management professionals depend on their understanding of plant science to help solve environmental problems and to inform biosecurity. Botany aims to increase and improve our supply of medicines, foods, and other plant products, and is critical for anyone interested in contributing to the sustainable future of our planet. In this unit, you will explore the origins, diversity, and global significance of plants. You will gain insights into the micro- and macro-evolutionary processes and patterns behind how plants moved from aquatic ecosystems to terrestrial ecosystems. Integrated lectures, practical classes and extensive online resources will allow you to develop and integrate practical skills and conceptual frameworks in plant identification, and plant physiology, morphology and anatomy. Lectures and practical classes are augmented by discussions to foster a sense of self-reliance and collaboration. The Advanced Botany unit of study requires engagement at a high standard of academic rigour and affords opportunities to engage with core aspect of Botany at depth and to create new knowledge. In partnership with academic staff advanced students will undertake an independent research project, which will develop skills in research and communication.

Textbooks

Attwell BJ, Kriedeman PE, Turnbull CGN. 1999. Plants In Action. Macmillan, South Yarra. (Australian Plant Biology with a good section on ecophysiology).
Judd WS, Campbell CS, Kellogg EA, Stephens PF. 2007. Plant Systematics: a phylogenetic approach. 3rd Ed. Sinauer Associates Inc Massachusetts USA
Pellow B, Henwood M, Carolin R.C., 2009. Flora of the Sydney Region. 5th edition. Sydney University Press.
Simpson, MG. 2010. Plant Systematics Ed 2 Academic press (or Ed 1 2006)
Taiz L. Zeiger E. 2010. Plant Physiology. 5th Ed Sinauer. Sunderland, Mass. **Essential.
Online learning resources:
Â¿LMS (currently BlackBoard)
Â¿BotanyOnline: http://botany.sydneybiology.org/

BIOL2031
Plants and Environment

Credit points: 6 **Teacher/Coordinator:** Prof Brent Kaiser **Session:** Semester 2 **Classes:** Two lectures; one 4-hour practical session on a weekly basis **Prohibitions:** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2931 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quiz (20%), lab assignment (15%), presentation (15%), exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Plants grow across a range of environments, influencing form, function and ultimately reproductive success. Being sessile, plants lack the luxury of seeking an alternative 'stress-free lifestyle' and therefore rely on genetic and physical adaptations to survive and reproduce. To understand how a plant can achieve such flexibility requires knowledge of plant structure and the influence of environmental drivers on plant growth and function. In this unit, you will examine the physiological processes controlling plant growth and reproduction linked to environmental constraints. You will understand the relationship between tissue and cellular structure and their underlying role in physiological and metabolic activities, particularly processes involving light capture, photosynthesis, water regulation, nutrient management and metabolite redistribution. Lectures and interactive practicals will together introduce you to plant processes that underpin life on earth. Experimentation and analysis of plant physiological processes will develop a skill base that will lead to a greater understanding and appreciation of common plant processes. As a component of the Plant Science minor and the Plant Production major, BIOL2031 will provide an important platform to extend your interests in plant science and plant related fields across the curriculum.

Textbooks

Taiz, L. and Zeiger, E. (2010) Plant Physiology, Fifth Edition. Sinauer Associates. Sunderland, MA.

BIOL2931
Plants and Environment (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Brent Kaiser **Session:** Semester 2 **Classes:** Two 1-hour lectures/week; one 4-hour practical/week **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2031 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** On-line quiz (20%), lab assignment (15%), independent project (15%), exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Plants grow across a range of environments, which influence form, function and ultimately reproductive success. Being sessile, plants lack the luxury of seeking an alternative 'stress-free lifestyle' and therefore rely on genetic and physical adaptations to help survive and reproduce. To understand how a plant can achieve such flexibility requires an understanding of plant structure and the influence that environmental drivers have on plant growth and function. In this unit, you will examine the physiological processes controlling plant growth and reproduction linked to environmental constraints. You will understand the relationship between tissue and cellular structure and their underlying role in physiological and metabolic activities, particularly processes involving light capture, photosynthesis, water regulation, nutrient management and metabolite redistribution. Lectures and interactive practicals will together introduce you to plant processes that we commonly depend upon for food production, and plant related materials. Experimentation and analysis of plant physiological processes will develop a skill base that will lead to a greater understanding and appreciation of common plant processes that guide plant growth. As a component of the Plant Science minor, this unit will provide an important platform to extend your interests in plant science and plant-related fields, including ecology, cell biology, genetics, breeding, agriculture, molecular biology, environmental law, education and the arts. The advanced unit has the same overall concepts as BIOL2031 but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in BIOL2931 participate in alternative components, which include a separate lecture and practical stream. The content and nature of these components may vary from year to year.

Textbooks

Resources required by the unit will be provided on the Blackboard learning management page for the unit. Taiz, L. and Zeiger, E. (2010) Plant Physiology, Fifth Edition. Sinauer Associates. Sunderland, MA.

3000-level units of study

Core

BIOL3020 to be developed for offering in 2019.

Selective

BIOL3009
Terrestrial Field Ecology

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** Note: One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3909 or BIOL2009 or BIOL2909 **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), specimen collection (10%), research project report (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

This intensive field-based course provides practical experience in terrestrial ecology suited to a broad range of careers in ecology, environmental consulting and wildlife management. Students learn a broad range of ecological sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. The field work takes place in native forest and incorporates survey techniques for plants, small mammals and invertebrates and thus provides a good background for ecological consulting work and an introduction into large-scale project management. Students attend a week-long field course and participate in a large-scale research project as well as conducting their own research project. Emphasis is placed on critical thinking in the context of environmental management and technical skills are developed in the area of data handling and analysis, report writing and team work. Invited experts contribute to the lectures and discussions on issues relating to the ecology, conservation and management of Australia's terrestrial flora and fauna.

BIOL3909
Terrestrial Field Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3009 or BIOL2009 or BIOL2909 **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), sample and data processing (10%), research project report (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered. This unit is not offered from 2019.

This unit has the same objectives as BIOL3009 Terrestrial Field Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from applicants on the basis of previous performance. Students taking this unit of study will complete an individual research project on a topic negotiated with a member of staff. It is expected that much of the data collection will be completed during the field trip but some extra time may be needed during semester 2. Specific details of this unit of study and assessment will be announced in meetings with students at the beginning of the unit. This unit of study may be taken as part of the BSc (Advanced) program.

BIOL3029 to be developed for offering in 2019.

Psychology

The School of Psychology is part of the Faculty of Science. Units of study in this major are available at standard level, except for PSYC2010 (available at advanced level in PSYC2910), and PSYC3011 (available at advanced level in PSYC3911), PSYC3013 (available at advanced level in PSYC3913), PSYC3014 (available at advanced level in PSYC3914) and PSYC3016 (available at advanced level in PSYC3916).

About the program

Psychology is both a profession and a science. That is, psychological phenomena are investigated using the scientific method; and the outcomes of these investigations are applied to diverse professional settings (eg. treatment of mental illness, job selection, health promotion, education policy, etc.).

When you study psychology, you will cover a range of areas including behavioural neuroscience, personality theory, social influences on the behaviour of individuals and groups, forensic psychology, health psychology, developmental psychology, abnormal psychology, memory, attention, intelligence, sensory processes and perception, research methods, and theories of learning and motivation.

The Psychology Program is designed to both meet the requirements for accreditation so that students can engage in further training to become registered and practicing psychologists AND/OR to engage in higher degree research in one or more of the areas of Psychological Science.

Requirements for completion

A program in Psychology requires 60 credit points, consisting of:

(i)6 credit points of 2000-level selective units
(ii)6 credit points of 3000-level core units
(iii)A 48 credit point major in Behavioural Sciences. Note that the above units must be taken in addition to those chosen in the major.

First year

In the first year, you will be introduced to all the disciplines in Psychology, including behavioural neuroscience, personality theory, social influences on the behaviour of individuals and groups, forensic psychology, health psychology, developmental psychology, abnormal psychology, memory, attention, intelligence, sensory processes and perception, research methods, and theories of learning and motivation.

Core: PSYC1001 and PSYC1002.

Second year

In the second year, you will study all the core disciplines introduced in first-year Psychology at a deeper level across four courses rather than two.

6cp from: PSYC2X10, PSYC2013, PSYC2014.

Students also complete units from their Behavioural Sciences major.

Accreditation for psychologists requires that students complete a program in which they receive training across the core disciplines of psychological sciences. The first and second year of the Psychology Program ensures that all graduates receive this training.

Third year

The third year courses allow students to continue their studies in the core research methods used in Psychology, and to specialise in a few of the major research disciplines in Psychology.

Students also complete units from their Behavioural Sciences major.

Students must complete 3000-level Statistics in order to be eligible for the Honours program. They may then choose to take specialist courses in the areas of Learning and Behaviour, Perceptual Systems, Cognitive Psychology, Neuroscience, Developmental Psychology, Social Psychology, Differential Psychology, Applied Psychology (Forensic, Health, Organisational), Clinical Psychology, and Theoretical Psychology.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Successful completion of an Honours year in Psychology is essential for accreditation. Completion of the full Psychology Program is required to undertake Honours in Psychology.

Requirements for Honours in the areas of Psychology: completion of 24 credit points of project work and 24 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W sydney.edu.au/science/psychology/current_students/accred_psychology_major.shtml

Address:
School of Psychology
Griffith Taylor Building (A19)
University of Sydney NSW 2006

Dr Ian Johnston
E i.johnston@sydney.edu.au
T +61 2 9351 4353

Psychology is the scientific study of human behaviour and mental processes. Professional training is available at the postgraduate level. The research activities of the school cover all of the main branches of the discipline. Extensive information about the subject and the school is available on the school website: sydney.edu.au/science/psychology

Learning Outcomes

Students who graduate from Psychology will be able to:

1. Describe in detail the major theories of the core disciplines in the Psychological Sciences: Learning and Behaviour, Perceptual Systems, Cognitive Psychology, Neuroscience, Developmental Psychology, Social Psychology, Differential Psychology, Applied Psychology (Forensic, Health, Organisational), Clinical Psychology, Research Methods and Statistics, and Theoretical Psychology.
2. Understand, apply, and evaluate basic research methods in Psychology, including research design, data analysis and interpretation, and the appropriate use of technologies.
3. Apply these concepts to personal, social, and professional issues.
4. Design, conduct, and interpret experimental research in psychology
5. Apply critical and creative thinking, skeptical inquiry, and the scientific approach to solve problems related to Psychology
6. Value empirical evidence; act ethically and professionally; and understand the complexity of sociocultural and international diversity
7. Evaluate and communicate the findings of research and literature through scientific research report, essays, orally, and in other media.

Psychology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PSYCHOLOGY			
Psychology program			
A program in Psychology requires 60 credit points from this table including: (i) 6 credit points of 2000-level selective units (ii) 6 credit points of 3000-level core units (iii) A 48 credit point major in Behavioural Sciences. Note that the above units must be taken in addition to those chosen in the major			
Units of study			
The units of study are listed below.			
2000-level units of study			
Selective			
PSYC2010 **Brain and Behaviour**	6	**P** PSYC1002 **N** PSYC2011, PSYC2911, PSYC2910	Semester 1
PSYC2910 **Brain and Behaviour (Advanced)**	6	**P** A mark of at least 75 in PSYC1002 **N** PSYC2011, PSYC2911, PSYC2010	Semester 1
PSYC2013 **Cognitive and Social Psychology**	6	**P** PSYC1001 and PSYC1002	Semester 2
PSYC2014 **Personality and Psychology Assessment 1**	6	**P** PSYC1001 and PSYC1002	Semester 2
3000-level units of study			
Core			
PSYC3010 **Advanced Statistics for Psychology**	6	**P** PSYC2012 plus at least one other Intermediate Psychology Unit of Study from PSYC2010, PSYC2910, PSYC2011, PSYC2911, PSYC2013, PSYC2014	Semester 2

Psychology

PSYCHOLOGY

Psychology program

A program in Psychology requires 60 credit points from this table including: (i) 6 credit points of 2000-level selective units (ii) 6 credit points of 3000-level core units(iii) A 48 credit point major in Behavioural Sciences. Note that the above units must be taken in addition to those chosen in the major

Units of study

The units of study are listed below.

2000-level units of study

Selective

PSYC2010
Brain and Behaviour

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2910 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study examines a range of phenomena and principles in behaviour, learning and perception, abnormal psychology and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes are designed for students with an interest in clinical and therapeutic Psychology, and will allow students to design and implement a behaviour modification programme.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.
Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2910
Brain and Behaviour (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Ian Johnston **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** A mark of at least 75 in PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2010 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study focuses on the Behavioural Sciences, Neurosciences, Abnormal Psychology and the study of perception. The lecture content is the same as PSYC2011, and examines a range of phenomena and principles in behaviour, learning and perception, and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes differ from PSYC2011, as it is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. Students will gain hands-on laboratory experience in how the principles and phenomena of behavioural neuroscience may be studied experimentally.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.
Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2013
Cognitive and Social Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** PSYC1001 and PSYC1002 **Assessment:** One 2 hour exam, major assignment (1500-2000 word essay/report), minor assignment (short written practical exercise and/or tutorial quiz) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit expands the depth and range of topics introduced in the first year lectures on Cognitive Processes, Social Psychology and Developmental Psychology. The section on Cognitive Processes focuses on current theories of memory, attention, and reasoning and discusses the methods and issues involved in investigating these processes in both healthy individuals and people with cognitive dysfunctions. The second section on Social Psychology examines salient social constructs such as impression management, and prejudice, and explores how mental processes affect social judgment and behaviour. The final section on Developmental Psychology presents and evaluates evidence about the early influences on children's social and cognitive development.

PSYC2014
Personality and Psychology Assessment 1

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** PSYC1001 and PSYC1002 **Assessment:** One 2 hour exam, major assignment (1500-2000 word essay/report), minor assignment (short written practical exercise and/or tutorial quizzes and/or class presentation) (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The main aim of this course is to introduce students to a number of influential theories in personality and intelligence. Students will be exposed to some conceptual analysis and will be expected to gain an understanding and be able to examine critically the various theories covered. Furthermore, students will be introduced to key topics in the scientific study and assessment of individual differences (Psychometrics) in personality and intelligence. The course will cover both conceptual (e.g. validity and reliability) and applied (e.g. Factor Analysis) elements of statistical psychometric inference.

3000-level units of study

Core

PSYC3010
Advanced Statistics for Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** PSYC2012 plus at least one other Intermediate Psychology Unit of Study from PSYC2010, PSYC2910, PSYC2011, PSYC2911, PSYC2013, PSYC2014 **Assessment:** One 2 hour exam, class tests, practical exercises (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study expands upon students' knowledge of the general linear model and its applications in the analysis of data from psychological research. The first half focuses on multiple regression and its extensions, which are used when the primary interest is to predict or explain a particular variable based on a set of other variables. The second half of the course introduces students to contrast analysis as an extension of ANOVA, which allows for more focused analysis of data where group comparisons are the primary interest.

Textbooks

Keith, Z. T. (2006). Multiple Regression and Beyond. New York: Pearson Education, Inc.

Quantitative Life Sciences

Quantitative Life Sciences is an interdisciplinary major. Units of study in this major are available at standard and advanced level.

About the major

This interdisciplinary major combines mathematics, statistics and information technology and applies them in areas of biological data analytics. This will give you the opportunity to explore the areas of bioinformatics, mathematical modelling and interpretation of data, all of which have become essential elements of biological research. It is a highly recommended second field of study for all students majoring in the life and environmental sciences.

Requirements for completion

A major in Quantitative Life Sciences requires 48 credit points, consisting of:

(i)6 credit points of 1000-level selective units
(ii)6 credit points of 1000-level core units
(iii)12 credit points of 2000-level selective units
(iv)6 credit points of 3000-level methodology units
(v)18 credit points of 3000-level selective specialisation units

A minor in Quantitative Life Sciences is available and articulates to this major.

First year

BIOL1XX7 and 6 credit points from a selection of: DATA1001, MATH1015, MATH1X05, MATH1X02, MATH1011, MATH1013, MATH1014.

Second year

12 credit points from a selection of: DATA2002, BIOL2X22, ENVX2001, QBIO2001.

Third year

6 credit points from a selection of: ENVX3002, QBIO3X01 and 18 credit points from a selection of: ENVX3002, QBIO3X01, BCHM3X92, BINF3101, ENVX3001, LWSC3007, GEGE3X04, PRJT3XXX, AMED3002, STAT3X14.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Quantitative Life Sciences: completion of 36 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9351 3012

Address:
Charles Perkins Centre D17
University of Sydney NSW 2006

Dr Mark Larance
E mark.larance@sydney.edu.au
T +61 02 8627 5571

A/Prof Thomas Bishop
E thomas.bishop@sydney.edu.au
T +61 2 8627 1056

Learning Outcomes

Students who graduate from Quantitative Life Sciences will be able to:

1. Recognise when higher order quantitative skills are needed for a systematic approach to the discovery of scientific conclusion based on large volumes of scientific data.
2. Identify at a general level the type of analytical approach that is required, whether that is data analysis, simulation models or equation-based models.
3. Understand the importance of experimental design and its relationship with data output and analysis.
4. Translate questions between disciplines and perform appropriate statistical analysis.
5. To be confident and knowledgeable in using a range of computational resources, including R, Python and other scripting languages (for statistical analysis, remote sensing, machine learning and publication quality visualisation and computational modelling), scientific formats (i.e. netCDF), databases (for storing and accessing metadata) and different approaches to graphical information systems (for mapping and sharing 2 dimensional data).
6. Connect to online data services, for meta-analysis, sub-setting and consumption of large data without the need to make a local copy.
7. Represent biological processes as mathematical or computational models and to use these models to explore, explain and predict scientific phenomena.
8. Interpret large-scale data sets and be able to highlight trends of most significance.

Quantitative Life Sciences

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
QUANTITATIVE LIFE SCIENCES			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Quantitative Life Sciences major			
A major in Quantitative Life Sciences requires 48 credit points from this table including: (i) 6 credit points of 1000-level selective units (ii) 6 credit points of 1000-level core units (iii) 12 credit points of 2000-level selective units (iv) 6 credit points of 3000-level methodology units (v) 18 credit points of 3000-level selective specialisation units			
Quantitative Life Sciences minor			
A minor in Quantitative Life Sciences requires 36 credit points from this table including: (i) 6 credit points of 1000-level selective units (ii) 6 credit points of 1000-level core units (iii) 12 credit points of 2000-level selective units (iv) 6 credit points of 3000-level methodology units (v) 6 credit points of 3000-level selective specialisation units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Selective			
DATA1001 **Foundations of Data Science**	6	**N** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021	Semester 1 Semester 2
MATH1015 **Biostatistics**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020	Semester 1
MATH1005 **Statistical Thinking with Data**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020	Semester 2 Summer Main Winter Main
MATH1905 **Statistical Thinking with Data (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 *Note: Department permission required for enrolment*	Semester 2
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1012 or MATH1014 or MATH1902	Semester 1 Summer Main
MATH1902 **Linear Algebra (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1002 or MATH1012 or MATH1014 *Note: Department permission required for enrolment*	Semester 1
MATH1011 **Applications of Calculus**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1001 or MATH1901 or MATH1906 or MATH1111 or BIOM1003 or ENVX1001 or MATH1021 or MATH1921 or MATH1931	Semester 1 Summer Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MATH1013 **Mathematical Modelling**	3	**A** HSC Mathematics or a credit or higher in MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1003 or MATH1903 or MATH1907 or MATH1023 or MATH1923 or MATH1933	Semester 2 Summer Main
MATH1014 **Introduction to Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1012 or MATH1002 or MATH1902	Semester 2
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
2000-level units of study			
Selective			
DATA2002 **Data Analytics: Learning from Data**	6	**A** (Basic Linear Algebra and some coding) or QBUS1040 **P** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **N** STAT2012 or STAT2912	Semester 2
BIOL2022 **Biology Experimental Design and Analysis**	6	**A** BIOL1XXX or MBLG1XXX **P** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **N** BIOL2922 or BIOL3006 or BIOL3906	Semester 2
BIOL2922 **Biol Experimental Design and Analysis Adv**	6	**A** BIOL1XXX or MBLG1XXX **P** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **N** BIOL2022 or BIOL3006 or BIOL3906	Semester 2
ENVX2001 **Applied Statistical Methods**	6	**P** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
QBIO2001 **Molecular Systems Biology**	6	**A** Metabolism, protein synthesis, gene regulation, quantitative and statistical skills	Semester 2
3000-level units of study			
Methodology units			
ENVX3002 **Statistics in the Natural Sciences**	6	**P** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 *Interdisciplinary Unit*	Semester 1
QBIO3X01 to be developed for offering in 2019.			
Specialisation units			
ENVX3002 **Statistics in the Natural Sciences**	6	**P** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 *Interdisciplinary Unit*	Semester 1
BCHM3092 **Proteomics and Functional Genomics**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3992 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3992 **Proteomics and Functional Genomics (Adv)**	6	**P** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3092 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BINF3101 **Bioinformatics Project**	6	**A** INFO2110 and (INFO1103 or INFO1903) **P** 12cp from (BIOL2XXX or MBLG2XXX or BCMB2XXX or GEGE2XXX or BCHM2XXX or MICR2XXX or PCOL2XXX or QBIO2XXX or ENVX2XXX or DATA2002 or GENE2002) **N** COMP3206 or BINF3001 or INFO3600 or SOFT3300 or SOFT3600 or SOFT3200 or SOFT3700	Semester 2
ENVX3001 **Environmental GIS**	6	**P** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX	Semester 2
LWSC3007 **Advanced Hydrology and Modelling**	6	**P** LWSC2002	Semester 1
AMED3002 **Interrogating Biomedical and Health Data**	6	**A** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
STAT3014 **Applied Statistics**	6	**A** STAT3012 or STAT3912 **P** DATA2002 or STAT2X12 **N** STAT3914 or STAT3002 or STAT3902 or STAT3006	Semester 2
STAT3914 **Applied Statistics Advanced**	6	**A** STAT3912 **P** STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002) **N** STAT3014 or STAT3907 or STAT3902 or STAT3006 or STAT3002	Semester 2
QBIO3X01, GEGE3X04 and PRJT3XXX to be developed for offering in 2019.			

Quantitative Life Sciences

QUANTITATIVE LIFE SCIENCES

Advanced coursework and projects will be available in 2020 for students who complete this major.

Quantitative Life Sciences major

A major in Quantitative Life Sciences requires 48 credit points from this table including:(i) 6 credit points of 1000-level selective units (ii) 6 credit points of 1000-level core units (iii) 12 credit points of 2000-level selective units(iv) 6 credit points of 3000-level methodology units (v) 18 credit points of 3000-level selective specialisation units

Quantitative Life Sciences minor

A minor in Quantitative Life Sciences requires 36 credit points from this table including:(i) 6 credit points of 1000-level selective units (ii) 6 credit points of 1000-level core units (iii) 12 credit points of 2000-level selective units (iv) 6 credit points of 3000-level methodology units(v) 6 credit points of 3000-level selective specialisation units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

Selective

DATA1001
Foundations of Data Science

Credit points: 6 **Teacher/Coordinator:** Dr Di Warren **Session:** Semester 1, Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prohibitions:** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021 **Assessment:** assignments, quizzes, presentation, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

DATA1001 is a foundational unit in the Data Science major. The unit focuses on developing critical and statistical thinking skills for all students. Does mobile phone usage increase the incidence of brain tumours? What is the public's attitude to shark baiting following a fatal attack? Statistics is the science of decision making, essential in every industry and undergirds all research which relies on data. Students will use problems and data from the physical, health, life and social sciences to develop adaptive problem solving skills in a team setting. Taught interactively with embedded technology, DATA1001 develops critical thinking and skills to problem-solve with data. It is the prerequisite for DATA2002.

Textbooks
Statistics, Fourth Edition, Freedman Pisani Purves

MATH1015
Biostatistics

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1015 is designed to provide a thorough preparation in statistics for students in the Biological and Medical Sciences. It offers a comprehensive introduction to data analysis, probability and sampling, inference including t-tests, confidence intervals and chi-squared goodness of fit tests.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1005
Statistical Thinking with Data

Credit points: 3 **Session:** Semester 2, Summer Main, Winter Main **Classes:** Lectures 2 hrs/week; Practical 1 hr/week **Prohibitions:** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In a data-rich world, global citizens need to problem solve with data, and evidence based decision-making is essential is every field of research and work.

This unit equips you with the foundational statistical thinking to become a critical consumer of data. You will learn to think analytically about data and to evaluate the validity and accuracy of any conclusions drawn. Focusing on statistical literacy, the unit covers foundational statistical concepts, including the design of experiments, exploratory data analysis, sampling and tests of significance.

Textbooks
Freedman, Pisani and Purves, Statistics, Norton, 2007

MATH1905
Statistical Thinking with Data (Advanced)

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. This Advanced level unit of study parallels the normal unit MATH1005 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1002
Linear Algebra

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1014 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1002 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study introduces vectors and vector algebra, linear algebra including solutions of linear systems, matrices, determinants, eigenvalues and eigenvectors.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1902
Linear Algebra (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1002 or MATH1012 or MATH1014 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. It parallels the normal unit MATH1002 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1011
Applications of Calculus

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1001 or MATH1901 or MATH1906 or MATH1111 or BIOM1003 or ENVX1001 or MATH1021 or MATH1921 or MATH1931 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed for science students who do not intend to undertake higher year mathematics and statistics. It establishes and reinforces the fundamentals of calculus, illustrated where possible with context and applications. Specifically, it demonstrates the use of (differential) calculus in solving optimisation problems and of (integral) calculus in measuring how a system accumulates over time. Topics studied include the fitting of data to various functions, the interpretation and manipulation of periodic functions and the evaluation of commonly occurring summations. Differential calculus is extended to functions of two variables and integration techniques include integration by substitution and the evaluation of integrals of infinite type.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1013
Mathematical Modelling

Credit points: 3 **Session:** Semester 2, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1003 or MATH1903 or MATH1907 or MATH1023 or MATH1923 or MATH1933 **Assumed knowledge:** HSC Mathematics or a credit or higher in MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1013 is designed for science students who do not intend to undertake higher year mathematics and statistics.

In this unit of study students learn how to construct, interpret and solve simple differential equations and recurrence relations. Specific techniques include separation of variables, partial fractions and first and second order linear equations with constant coefficients. Students are also shown how to iteratively improve approximate numerical solutions to equations.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1014
Introduction to Linear Algebra

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1002 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **Assessment:** One 1.5 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an introduction to Linear Algebra. Topics covered include vectors, systems of linear equations, matrices, eigenvalues and eigenvectors. Applications in life and technological sciences are emphasised.

Textbooks

As set out in the Junior Mathematics Handbook.

ENVX1002
Introduction to Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Thomas Bishop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour tutorial per week, one 2-hour computer practical per week **Prohibitions:** ENVX1001 **Assessment:** One exam during the exam period (50%), three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This is an introductory statistics unit for students in the agricultural, life and environmental sciences. It provides the foundation for statistics and data science skills that are needed for a career in science and for further study in applied statistics and data science. In the first portion of the unit the emphasis is on describing data using statistical and graphical summaries, and probability models. In the second part the focus is on formal hypothesis testing on experimental data using statistical tests. The final part of the unit is on finding patterns in biological and environmental data, through the use of linear and non-linear functions. In the practicals the emphasis is on applying theory to analysing real datasets using the spreadsheet package Excel and the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:

- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).

- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

2000-level units of study

Selective

DATA2002
Data Analytics: Learning from Data

Credit points: 6 **Teacher/Coordinator:** Jean Yang **Session:** Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prerequisites:** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **Prohibitions:** STAT2012 or STAT2912 **Assumed knowledge:** (Basic Linear Algebra and some coding) or QBUS1040 **Assessment:** written assignment, presentation, exams **Mode of delivery:** Normal (lecture/lab/tutorial) day

Technological advances in science, business, engineering has given rise to a proliferation of data from all aspects of our life. Understanding the information presented in these data is critical as it enables informed decision making into many areas including market intelligence and science. DATA2002 is an intermediate course in statistics and data sciences, focusing on learning data analytic skills for a wide range of problems and data. How should the Australian government measure and report employment and unemployment? Can we tell the difference between decaffeinated and regular coffee ? In this course, you will learn how to ingest, combine and summarise data from a variety of data models which are typically encountered in data science projects as well as reinforcing their programming skills through experience with statistical programming language. You will also be exposed to the concept of statistical machine learning and develop the skill to analyze various types of data in order to answer a scientific question. From this unit, you will develop knowledge and skills that will enable you to embrace data analytic challenges stemming from everyday problems.

BIOL2022
Biology Experimental Design and Analysis

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **Prohibitions:** BIOL2922 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides foundational skills essential for doing research in biology and for critically judging the research of others. We consider how biology is practiced as a quantitative, experimental and theoretical science. We focus on the underlying principles and practical skills you need to explore questions and test hypotheses, particularly where background variation (error) is inherently high. In so doing, the unit provides you with an understanding of how biological research is designed, analysed and interpreted using statistics. Lectures focus on sound experimental and statistical principles, using examples in ecology and other fields of biology to demonstrate concepts. In the practical sessions, you will design and perform, analyse (using appropriate statistical tools) and interpret your own experiments to answer research questions in topics relevant to your particular interest. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and M. J. Keough. 2002. Experimental Design and Data Analysis for Biologists. 1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2922
Biol Experimental Design and Analysis Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or

DATA1001 or MATH1XX5)] **Prohibitions:** BIOL2022 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2922 will be based on BIOL2022 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and Keough, 2002. Experimental Design and Data Analysis for Biologists.1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

ENVX2001
Applied Statistical Methods

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 3-hour computer practical per week **Prerequisites:** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] **Assessment:** One exam during the exam period (50%),three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This unit builds on introductory 1st year statistics units and is targeted towards students in the agricultural, life and environmental sciences. It consists of two parts and presents, in an applied manner, the statistical methods that students need to know for further study and their future careers. In the first part the focus is on designed studies including both surveys and formal experimental designs. Students will learn how to analyse and interpret datasets collected from designs from more than than 2 treatment levels, multiple factors and different blocking designs. In the second part the focus is on finding patterns in data. In this part the students will learn to model relationships between response and predictor variables using regression, and find patterns in datasets with many variables using principal components analysis and clustering. This part provides the foundation for the analysis of big data. In the practicals the emphasis is on applying theory to analysing real datasets using the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

QBIO2001
Molecular Systems Biology

Credit points: 6 **Teacher/Coordinator:** Prof David James (Coordinator), Dr Mark Larance **Session:** Semester 2 **Classes:** Two 1-hour lectures; one 3-hour practical session on a weekly basis **Assumed knowledge:** Metabolism, protein synthesis, gene regulation, quantitative and statistical skills **Assessment:** One 3-hour final exam (50%), three 45-minute quizzes (20%), one 5-minute presentation (10%), laboratory assessment and practical book (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Experimental approaches to the study of biological systems are shifting from hypothesis driven to hypothesis generating research. Large scale experiments at the molecular scale are producing enormous quantities of data ("Big Data") that need to be analysed to derive significant biological meaning. For example, monitoring the abundance of tens of thousands of proteins simultaneously promises ground-breaking discoveries. In this unit, you will develop specific analytical skills required to work with data obtained in the biological and medical sciences. The unit covers quantitative analysis of biological systems at the molecular scale including modelling and visualizing patterns using differential equations, experimental design and data types to understand disease aetiology. You will also use methods to model cellular systems including metabolism, gene regulation and signalling. The practical program will enable you to generate data analysis workflows, and gain a deep understanding of the statistical, informatics and modelling tools currently being used in the field. To leverage multiple types of expertise, the computer lab-based practical component of this unit will be predominantly a team-based collaborative learning environment. Upon completion of this unit, you will have gained skills to find meaningful solutions to difficult biological and disease-related problems with the potential to change our lives.

Textbooks

An Introduction to Systems Biology: Design Principles of Biological Circuits, Uri Alon, (Chapman and Hall/CRC, 2007). Systems Biology, Edda Klipp, Wolfram Liebermeister, Christoph Wierling, Axel Kowald, Hans Lehrach, and Ralf Herwig, (Wiley-Blackhall, 2009). Molecular biology of the cell, Alberts B et al (6th edition, Garland Science, 2015) Discovering Statistics Using R, Andy Field (2012, SAGE Publications Ltd). Computational and Statistical Methods for Protein Quantitation by Mass Spectrometry, Martens L et al (Wiley, 2013)

3000-level units of study

Methodology units

ENVX3002
Statistics in the Natural Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** one 2-hour workshop per week, one 3-hour computer practical per week **Prerequisites:** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 **Assessment:** One exam during the exam period (50%), five assessment tasks (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Interdisciplinary Unit

This unit of study is designed to introduce students to the analysis of data they may face in their future careers, in particular data that are not well behaved. The data may be non-normal, there may be missing observations, they may be correlated in space and time or too numerous to analyse with standard models. The unit is presented in an applied context with an emphasis on correctly analysing authentic datasets, and interpreting the ouput. It begins with the analysis and design experiments based on the general linear model. In the second part, students will learn about the generalisation of the general linear model to accommodate non-normal data with a particular emphasis on the binomial and poisson distributions. In the third part linear mixed models will be introduced which provide the means to analyse datasets that do not meet the assumptions of independent and equal errors, for example data that is correlated in space and time. The units ends with an introduction to machine learning and predictive modelling. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

QBIO3X01 to be developed for offering in 2019.

Specialisation units

ENVX3002
Statistics in the Natural Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** one 2-hour workshop per week, one 3-hour computer practical per week **Prerequisites:** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 **Assessment:** One exam during the exam period (50%), five assessment tasks (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Interdisciplinary Unit

This unit of study is designed to introduce students to the analysis of data they may face in their future careers, in particular data that are not well behaved. The data may be non-normal, there may be missing observations, they may be correlated in space and time or too numerous to analyse with standard models. The unit is presented in an applied context with an emphasis on correctly analysing authentic datasets, and interpreting the ouput. It begins with the analysis and design experiments based on the general linear model. In the second part, students will learn about the generalisation of the general linear model to accommodate non-normal data with a particular emphasis on the binomial and poisson distributions. In the third part linear mixed models will be introduced which provide the means to analyse datasets that do not meet the assumptions of independent and equal errors, for example data that is correlated in space and time. The units ends with an introduction to machine learning and predictive modelling. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

BCHM3092
Proteomics and Functional Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Stuart Cordwell, Jill Johnston **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and one 3-hour practical per week. **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3992 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will focus on the high throughput methods for the analysis of gene structure and function (genomics) and the analysis of proteins (proteomics), which are at the forefront of discovery in the biomedical sciences. The course will concentrate on the hierarchy of gene-protein-structure-function through an examination of modern technologies built on the concepts of genomics versus molecular biology, and proteomics versus biochemistry. Technologies to be examined include DNA sequencing, nucleic acid and protein microarrays, two-dimensional gel electrophoresis of proteins, uses of mass spectrometry for high throughput protein identification, isotope tagging for quantitative proteomics, high-performance liquid chromatography, high-throughput functional assays, affinity chromatography and modern methods for database analysis. Particular emphasis will be placed on how these technologies can provide insight into the molecular basis of changes in cellular function under both physiological and pathological conditions as well as how they can be applied to biotechnology for the discovery of biomarkers, diagnostics, and therapeutics. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in proteomics and genomics.

BCHM3992
Proteomics and Functional Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Stuart Cordwell, Jill Johnston **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and one 3-hour practical per fortnight. **Prerequisites:** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3092 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will focus on the high throughput methods for the analysis of gene structure and function (genomics) and the analysis of proteins (proteomics) which are at the forefront of discovery in the biomedical sciences. The course will concentrate on the hierarchy of gene-protein-structure-function through an examination of modern technologies built on the concepts of genomics versus molecular biology, and proteomics versus biochemistry. Technologies to be examined include DNA sequencing, nucleic acid and protein microarrays, two-dimensional gel electrophoresis of proteins, uses of mass spectrometry for high throughput protein identification, isotope tagging for quantitative proteomics, high-performance liquid chromatography, high-throughput functional assays, affinity chromatography and modern methods for database analysis. Particular emphasis will be placed on how these technologies can provide insight into the molecular basis of changes in cellular function under both physiological and pathological conditions as well as how they can be applied to biotechnology for the discovery of biomarkers, diagnostics, and therapeutics. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in proteomics and genomics.

The lecture component of this unit of study is the same as BCHM3092. Qualified students will attend seminars/practical classes in which more sophisticated topics in proteomics and genomics will be covered.

BINF3101
Bioinformatics Project

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 2 **Classes:** Meeting with academic supervisor 1 hour per week and class meeting 1 hour per week. **Prerequisites:** 12cp from (BIOL2XXX or MBLG2XXX or BCMB2XXX or GEGE2XXX or BCHM2XXX or MICR2XXX or PCOL2XXX or QBIO2XXX or ENVX2XXX or DATA2002 or GENE2002) **Prohibitions:** COMP3206 or BINF3001 or INFO3600 or SOFT3300 or SOFT3600 or SOFT3200 or SOFT3700 **Assumed knowledge:** INFO2110 and (INFO1103 or INFO1903) **Assessment:** Oral group presentations, individual and group reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide students an opportunity to apply the knowledge and practice the skills acquired in the prerequisite and qualifying units, in the context of designing and building a substantial bioinformatics application. Working in groups, students will carry out the full range of activities including requirements capture, analysis and design, coding, testing and documentation.

ENVX3001
Environmental GIS

Credit points: 6 **Teacher/Coordinator:** A/Prof Inakwu Odeh **Session:** Semester 2 **Classes:** Three-day field trip, (two lectures and two practicals per week) **Prerequisites:** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX **Assessment:** One 15-minute presentation (10%), 3500wd prac report (35%), 1500wd report on trip excursion (15%), 2-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to impart knowledge and skills in spatial analysis and geographical information science (GISc) for decision-making in an environmental context. The lecture material will present several themes: principles of GISc, geospatial data sources and acquisition methods, processing of geospatial data and spatial statistics. Practical exercises will focus on learning geographical information systems (GIS) and how to apply them to land resource assessment, including digital terrain modelling, land-cover assessment, sub-catchment modelling, ecological applications, and soil quality assessment for decisions regarding sustainable land use and management. A three day field excursion during the mid-semester break will involve a day of GPS fieldwork at Arthursleigh University farm and two days in Canberra visiting various government agencies which research and maintain GIS coverages for Australia. By the end of this UoS, students should be able to: differentiate between spatial data and spatial information; source geospatial data from government and private agencies; apply conceptual models of spatial phenomena for practical decision-making in an environmental context; apply critical analysis of situations to apply the concepts of spatial analysis to solving environmental and land resource problems; communicate effectively results of GIS investigations through various means- oral, written and essay formats; and use a major GIS software package such as ArcGIS.

Textbooks

Burrough, P.A. and McDonnell, R.A. 1998. Principles of Geographic Information Systems. Oxford University Press: Oxford.
Clarke, K. C. 2003. Getting Started With Geographic Information Systems. 4th Edition. Prentice Hall: Upper Saddle River, New Jersey.

LWSC3007
Advanced Hydrology and Modelling

Credit points: 6 **Teacher/Coordinator:** A/Prof Willem Vervoort (Coordinator), Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** 2-hour lecture per week, 3-hour practical per week **Prerequisites:** LWSC2002 **Assessment:** Four practical assessments and reports (50%), take-home exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to allow students to examine advanced hydrological modeling focusing on catchment level responses and uncertainty. Students will learn how to develop their own simulation model of catchment hydrological processes in R and using SWAT and review the possibilities and impossibilities of using simulation models for catchment management. Students will further investigate landuse change impacts and climate change impacts the variability in hydrological responses. At the end of this unit, students will be able to calibrate and evaluate a catchment model, articulate advantages and disadvantages of using simulation models for catchment management, justify the choice of a simulation model for a particular catchment management problem, identify issues in relation to uncertainty in water quality and quantity The students will gain research and inquiry skills through research based assignments, information literacy and communication skills through laboratory reports and a presentation and personal and intellectual autonomy through working in groups.

Textbooks

Textbooks (Recommended reading)

Beven, K.J. Rainfall-Runoff modeling, The Primer, John Wiley and Sons, Chichester, 2001

AMED3002
Interrogating Biomedical and Health Data

Credit points: 6 **Teacher/Coordinator:** Prof Jean Yang **Session:** Semester 1 **Classes:** face to face 5 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assumed knowledge:** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. **Assessment:** in-semester exam, assignments, presentation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Biotechnological advances have given rise to an explosion of original and shared public data relevant to human health. These data, including the monitoring of expression levels for thousands of genes and proteins simultaneously, together with multiple databases on biological systems, now promise exciting, ground-breaking discoveries in complex diseases. Critical to these discoveries will be our ability to unravel and extract information from these data. In this unit, you will develop analytical skills required to work with data obtained in the medical and diagnostic sciences. You will explore clinical data using powerful, state of the art methods and tools. Using real data sets, you will be guided in the application of modern data science techniques to interrogate, analyse and represent the data, both graphically and numerically. By analysing your own real data, as well as that from large public resources you will learn and apply the methods needed to find information on the relationship between genes and disease. Leveraging expertise from multiple sources by working in team-based collaborative learning environments, you will develop knowledge and skills that will enable you to play an active role in finding meaningful solutions to difficult problems, creating an important impact on our lives.

STAT3014
Applied Statistics

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** DATA2002 or STAT2X12 **Prohibitions:** STAT3914 or STAT3002 or STAT3902 or STAT3006 **Assumed knowledge:** STAT3012 or STAT3912 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has three distinct but related components: Multivariate analysis; sampling and surveys; and generalised linear models. The first component deals with multivariate data covering simple data reduction techniques like principal components analysis and core multivariate tests including Hotelling's T^2, Mahalanobis' distance and Multivariate Analysis of Variance (MANOVA). The sampling section includes sampling without replacement, stratified sampling, ratio estimation, and cluster sampling. The final section looks at the analysis of categorical data via generalized linear models. Logistic regression and log-linear models will be looked at in some detail along with special techniques for analyzing discrete data with special structure.

STAT3914
Applied Statistics Advanced

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour computer laboratory per week plus an extra hour each week which will alternate between lectures and tutorials. **Prerequisites:** STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002) **Prohibitions:** STAT3014 or STAT3907 or STAT3902 or STAT3006 or STAT3002 **Assumed knowledge:** STAT3912 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an Advanced version of STAT3014. There will be 3 lectures per week in common with STAT3014. The unit will have extra lectures focusing on multivariate distribution theory developing results for the multivariate normal, partial correlation, the Wishart distribution and Hotelling's T^2. There will also be more advanced tutorial and assessment work associated with this unit.

QBIO3X01, GEGE3X04 and PRJT3XXX to be developed for offering in 2019.

Software Development

The School of Information Technologies aims to teach fundamental principles and practical skills in IT, and to establish the foundations for an entire career. Units of study in Software Development major are available at standard and advanced level.

About the major

A major in software development provides the understanding and skill that allow a team to reliably produce high-quality working software that meets client needs. From a foundation of individual programming skill, you will learn the theory and practices involved in determining requirements, designing software solutions, and delivering the outcomes.

Requirements for completion

A major in Software Development requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)18 credit points of 2000-level core units
(iii)18 credit points of 3000-level core units, including 1 interdisciplinary project unit

A minor in Software Development is available and articulates to this major.

First year

Core: INFO1110 and INFO1113.

Second year

Core: COMP2X23, SOFT2201, SOFT2412.

Third year

Core: SOFT3202, SOFT3413, SOFT3410.

In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Software Development: completion of 24 credit points of project work and 24 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W https://sydney.edu.au/engineering/about/school-of-information-technologies.html
E info@it.usyd.edu.au
T +61 2 9351 3423

Address:
School of Information Technologies J12
University of Sydney NSW 2006

Dr Josiah Poon
E josiah.poon@sydney.edu.au
T +61 2 9351 7185

Learning Outcomes

1. Students can work effectively as a software developers in a medium-scale team.
2. Individually and as a team, students can interact with clients to determine software requirements.
3. Individually and as a team, students are able to produce usable software artefacts that meet users' requirements.
4. Individually and as a team, students are able to follow and apply process to ensure the delivery of quality artefacts within resource constraints.
5. Students learn to use and apply contemporary software development tools and practices.
6. Students learn to structure software well on small and medium scale.
7. Students can learn new tools, languages, processes and technologies as they arise.
8. Students learn to evaluate software (own and others).
9. Students are made aware of diversity of programming paradigms and platforms.
10. Students are able to apply foundational computer science knowledge of algorithms and data structures.

Software Development

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
SOFTWARE DEVELOPMENT Advanced coursework and projects will be available in 2020 for students who complete this major.			
Software Development major A major in Software Development requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units, including 1 interdisciplinary project unit			
Software Development minor A minor in Software Development requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 6 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
INFO1110 **Introduction to Programming**	6		Intensive July Semester 1 Semester 2
INFO1113 **Object-Oriented Programming**	6	**P** INFO1110 **N** INFO1103 OR INFO1105 OR INFO1905	Semester 1 Semester 2
2000-level units of study			
Core			
COMP2123 **Data Structures and Algorithms**	6	**P** INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **N** INFO1105 OR INFO1905 OR COMP2823	Semester 1
COMP2823 **Data Structures and Algorithms (Adv)**	6	**P** Distinction level result in at least one of INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **N** INFO1105 OR INFO1905 OR COMP2123 *Note: Department permission required for enrolment*	Semester 1
SOFT2201 **Software Construction and Design 1**	6	**P** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 **N** INFO3220	Semester 2
SOFT2412 **Agile Software Development Practices**	6	**P** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905	Semester 2
3000-level units of study			
Major core			
SOFT3202 **Software Construction and Design 2**	6	**P** SOFT2201 **N** INFO3220	Semester 1
SOFT3413 **Software Development Project**	6	**A** SOFT3202 **P** 18CP 2000-level or above units from SOFT, COMP or INFO	Semester 2
SOFT3410 **Concurrency for Software Development**	6	**P** (INFO1105 OR INFO1905) OR ((INFO1103 OR INFO1113) AND (COMP2123 OR COMP2823))	Semester 2
Minor selective			
SOFT3202 **Software Construction and Design 2**	6	**P** SOFT2201 **N** INFO3220	Semester 1
SOFT3410 **Concurrency for Software Development**	6	**P** (INFO1105 OR INFO1905) OR ((INFO1103 OR INFO1113) AND (COMP2123 OR COMP2823))	Semester 2

Software Development

SOFTWARE DEVELOPMENT

Advanced coursework and projects will be available in 2020 for students who complete this major.

Software Development major

A major in Software Development requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units, including 1 interdisciplinary project unit

Software Development minor

A minor in Software Development requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 18 credit points of 2000-level core units (iii) 6 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

INFO1110
Introduction to Programming

Credit points: 6 **Session:** Intensive July, Semester 1, Semester 2 **Classes:** lectures, laboratories, seminars **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an essential starting point for software developers, IT consultants, and computer scientists to build their understanding of principle computer operation. Students will obtain knowledge and skills with procedural programming. Crucial concepts include defining data types, control flow, iteration, functions, recursion, the model of addressable memory. Students will be able to reinterpret a general problem into a computer problem, and use their understanding of the computer model to develop source code. This unit trains students with software development process, including skills of testing and debugging. It is a prerequisite for more advanced programming languages, systems programming, computer security and high performance computing.

INFO1113
Object-Oriented Programming

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** lectures, laboratories, seminars **Prerequisites:** INFO1110 **Prohibitions:** INFO1103 OR INFO1105 OR INFO1905 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Object-oriented (OO) programming is a technique that arranges code into classes, each encapsulating in one place related data and the operations on that data. Inheritance is used to reuse code from a more general class, in specialised situations. Most modern programming languages provide OO features. Understanding and using these are an essential skill to software developers in industry. This unit provides the student with the concepts and individual programming skills in OO programming, starting from their previous mastery of procedural programming.

2000-level units of study

Core

COMP2123
Data Structures and Algorithms

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **Prohibitions:** INFO1105 OR INFO1905 OR COMP2823 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will teach some powerful ideas that are central to solving algorithmic problems in ways that are more efficient than naive approaches. In particular, students will learn how data collections can support efficient access, for example, how a dictionary or map can allow key-based lookup that does not slow down linearly as the collection grows in size. The data structures covered in this unit include lists, stacks, queues, priority queues, search trees, hash tables, and graphs. Students will also learn efficient techniques for classic tasks such as sorting a collection. The concept of asymptotic notation will be introduced, and used to describe the costs of various data access operations and algorithms.

COMP2823
Data Structures and Algorithms (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** Distinction level result in at least one of INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **Prohibitions:** INFO1105 OR INFO1905 OR COMP2123 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will teach some powerful ideas that are central to solving algorithmic problems in ways that are more efficient than naive approaches. In particular, students will learn how data collections can support efficient access, for example, how a dictionary or map can allow key-based lookup that does not slow down linearly as the collection grows in size. The data structures covered in this unit include lists, stacks, queues, priority queues, search trees, hash tables, and graphs. Students will also learn efficient techniques for classic tasks such as sorting a collection. The concept of asymptotic notation will be introduced, and used to describe the costs of various data access operations and algorithms.

SOFT2201
Software Construction and Design 1

Credit points: 6 **Session:** Semester 2 **Classes:** lectures, laboratories **Prerequisites:** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 **Prohibitions:** INFO3220 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces the foundations of software design and construction. It covers the topics of modelling software (UML, CRC, use cases), software design principles, object-oriented programming theory (inheritance, polymorphism, dynamic subtyping and generics), and simple design patterns. The unit aims to foster a strong technical understanding of the underlying software design and construction theory (delivered in the lecture) but also has a strong emphasis of the practice, where students apply the theory on practical examples.

SOFT2412
Agile Software Development Practices

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit builds students skills to follow defined processes in software development, in particular, working in small teams in an agile approach. Content covers the underlying concepts and principles of software processes, their analysis, measurement and improvement. Students will practice with a variety of professional-strength tool support for the practices that ensure quality outcomes. The unit requires students to enter already skilled in individual programming; instead this unit focuses on the complexities in a team setting.

3000-level units of study

Major core

SOFT3202
Software Construction and Design 2

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, laboratories **Prerequisites:** SOFT2201 **Prohibitions:** INFO3220 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is a sequel of Software Construction and Design I (SOFT2301). It introduces advanced concepts which build on the topics of SOFT2301. SOFT3302 covers topics including software validation and verification, the theory of testing, and advanced design patterns. The unit has a strong focus on the theoretical underpinning of software design. I the labs the theory is applied with contemporary tools with concrete examples.

SOFT3413
Software Development Project

Credit points: 6 **Session:** Semester 2 **Classes:** project work, site visits, meetings **Prerequisites:** 18CP 2000-level or above units from SOFT, COMP or INFO **Assumed knowledge:** SOFT3202 **Assessment:** through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide students an opportunity to apply the knowledge and practice the skills acquired in the prerequisite and qualifying units, in the context of designing and building a substantial software development system in diverse application domains including life sciences. Working in groups for an external client combined with academic supervision, students will need to carry out the full range of activities including requirements capture, analysis and design, coding, testing and documentation. Students will use the XP methodology and make use of professional tools for the management of their project.

SOFT3410
Concurrency for Software Development

Credit points: 6 **Session:** Semester 2 **Classes:** lectures, laboratories **Prerequisites:** (INFO1105 OR INFO1905) OR ((INFO1103 OR INFO1113) AND (COMP2123 OR COMP2823)) **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The manufacturing industry has experienced a radical shift in the way they design computers, with the integration of multiple processors on the same chip. This hardware shift now requires software developers to acquire the skills that will allow them to write efficient concurrent software. Software developers used to wait for manufacturers to increase the clock frequency of their processors to see increases in the performance of their programs, the challenge is now to exploit, in the same program, more and more processing resources rather than faster processing resources. In this unit, you will learn how to tackle the problems underlying this challenge, including developing and testing concurrent programs, synchronizing resources between concurrent threads, overcoming fairness issues and guaranteeing progress, and ensuring scalability in the level of concurrency.

Minor selective

SOFT3202
Software Construction and Design 2

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, laboratories **Prerequisites:** SOFT2201 **Prohibitions:** INFO3220 **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is a sequel of Software Construction and Design I (SOFT2301). It introduces advanced concepts which build on the topics of SOFT2301. SOFT3302 covers topics including software validation and verification, the theory of testing, and advanced design patterns. The unit has a strong focus on the theoretical underpinning of software design. I the labs the theory is applied with contemporary tools with concrete examples.

SOFT3410
Concurrency for Software Development

Credit points: 6 **Session:** Semester 2 **Classes:** lectures, laboratories **Prerequisites:** (INFO1105 OR INFO1905) OR ((INFO1103 OR INFO1113) AND (COMP2123 OR COMP2823)) **Assessment:** through semester assessment (50%), final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The manufacturing industry has experienced a radical shift in the way they design computers, with the integration of multiple processors on the same chip. This hardware shift now requires software developers to acquire the skills that will allow them to write efficient concurrent software. Software developers used to wait for manufacturers to increase the clock frequency of their processors to see increases in the performance of their programs, the challenge is now to exploit, in the same program, more and more processing resources rather than faster processing resources. In this unit, you will learn how to tackle the problems underlying this challenge, including developing and testing concurrent programs, synchronizing resources between concurrent threads, overcoming fairness issues and guaranteeing progress, and ensuring scalability in the level of concurrency.

Soil Science and Hydrology

About the major

Soil and water security are major human existential challenges to the planet and more so in Australia, being the driest continent with highly weathered soils. The Soil Science and Hydrology major provides students with training in three key areas; soil, water and climate, and their links with functional, resilient and productive ecosystems. Soil, water and climate define the physical constraints to ecosystems, and the interpreting of these along with their costs and benefits supports the development of policy and sustainable management strategies. This knowledge will help secure our soil and water resources to maintain healthy, functional and productive ecosystems. We will explore the complex interaction between soil, water and climate, and the way we manage our landscapes. Ecosystems are considered across paddock to catchment scales and include all sectors from agriculture to forestry to mining to nature reserves.

This major has a strong emphasis on field-based learning through field schools and emphasis on field measurement and modelling through analysis of non-spatial and spatial data. Working with case studies and projects, you will identify and analyse real-world problems with the aim of identifying options to maintain the functionality of these interrelated systems. Students will develop generic skills in GIS, laboratory and data analysis that will enable students to contribute to water and soil security.

Requirements for completion

A major in Soil Science and Hydrology requires 48 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)18 credit points of 3000-level core units
(iv)6 credit points of 3000-level selective units

A minor Soil Science and Hydrology is available and articulates to this major.

First year

Core: BIOL1XX7 and BIOL1XX6

Second year

Core: GEOS2X16 and SOIL2005

The second year provides the breadth of knowledge in soil, hydrology, and landscapes processes with units related soil science and hydrology along with units focusing on earth surface processes.

Third year

LWSC3007, SOIL3011, ENVX3001 and 6 credit points from a selection of: ENVX3002 and GEOS3X19

The third year provides further depth in in soil science and hydrology and this is complimented by developing skill in spatial and temporal analysis and data analytics. This will involve working on real world problems and developing options to support the functionality of landscapes. In your third year you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000-level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Soil Science and Hydrology: completion of 24 credit points of project work and 12 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W http://sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9036 5417

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building (F07)
University of Sydney NSW 2006

Associate Professor Damien Field
Email: damien.field@sydney.edu.au
Phone: +61 2 8627 1138

Learning Outcomes

Students who graduate from Soil Science and Hydrology will be able to:

1. Understand the unique features of soil science and hydrology with a particular focus on the theories, concepts and principle sub-disciplines
2. Understand how knowledge of soil science and hydrology is integrated with other disciplines particularly within agriculture, ecology and the environment
3. Explain the relevance and application of soil science and hydrology in the study of contemporary agricultural, ecological and environmental issues, which underpins changes in policy and management strategies
4. Develop strong field and laboratory analytical skills and the ability to quantify, analyse and interpret integrated soil and water data
5. Integrate soil science and hydrology through research –based projects and developed expertise solving real-world problems and engaging directly with industry
6. Communicate soil science and hydrology concepts and knowledge effectively to specialist and non-specialist audiences using appropriate oral, written and visual means.
7. Contribute effectively as a member of leader of diverse teams working in soil and hydrology or multidisciplinary contexts.

Soil Science and Hydrology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
SOIL SCIENCE AND HYDROLOGY			
Advanced coursework and projects will be available in 2020 for students who complete this major.			
Soil Science and Hydrology major			
A major in Soil Science and Hydrology requires 48 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units			
Soil Science and Hydrology minor			
A minor in Soil Science and Hydrology requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
2000-level units of study			
Core			
GEOS2116 **Earth Surface Processes**	6	**N** GEOS2916 or GEOG2321	Semester 2
GEOS2916 **Earth Surface Processes (Advanced)**	6	**P** Annual average mark of at least 70 **N** GEOS2116 or GEOG2321	Semester 2
SOIL2005 **Soil and Water: Earth's Life Support Systems**	6	**N** SOIL2003 or LWSC2002	Semester 1
3000-level units of study			
Major core			
LWSC3007 **Advanced Hydrology and Modelling**	6	**P** LWSC2002	Semester 1
ENVX3001 **Environmental GIS**	6	**P** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX	Semester 2
SOIL3011 to be developed for offering in 2019.			

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Major selective			
ENVX3002 **Statistics in the Natural Sciences**	6	**P** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 *Interdisciplinary Unit*	Semester 1
GEOS3X19 to be developed for offering in 2019.			
Minor core			
LWSC3007 **Advanced Hydrology and Modelling**	6	**P** LWSC2002	Semester 1
SOIL3011 to be developed for offering in 2019.			

Soil Science and Hydrology

SOIL SCIENCE AND HYDROLOGY

Advanced coursework and projects will be available in 2020 for students who complete this major.

Soil Science and Hydrology major

A major in Soil Science and Hydrology requires 48 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 18 credit points of 3000-level core units (iv) 6 credit points of 3000-level selective units

Soil Science and Hydrology minor

A minor in Soil Science and Hydrology requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

2000-level units of study

Core

GEOS2116
Earth Surface Processes

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x3-hr practical (lab/computer) sessions each week **Prohibitions:** GEOS2916 or GEOG2321 **Assessment:** practical and field assignments, final exam **Practical field work:** 3-5 day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

The surface of the planet on which you live is the product of a balance between tectonic forces and numerous agents of erosion. The landscapes in which you live and work, and from which you draw resources, are therefore the legacy of many processes operating synchronously over long time periods. It is also true that Earth's landscapes are dynamic, and constantly changing around you in response to climate, tectonics and patterns of life. The sustainable management of landscapes is strongly dependent upon an awareness of those processes and the ways that they constrain human-environment interactions. In Earth Surface Processes, you will learn how landscapes are produced, and what this means for contemporary land use. Lectures by experts in physical geography, geology, soil science and environmental science will introduce you to the planetary and regional-scale controls on landforms and landscape dynamics, and the nature and distribution of major Australian landscape types. Focussed around 'hands on' field and laboratory-based tasks, students will gain essential practical, analytical and interpretive skills in the analysis of landscapes and earth surface processes that shape them. This is a unit for anyone wanting to better understand the planet on which they live.

Textbooks
Allen, P.A., 2009. Earth surface processes. John Wiley and Sons. Scitech, 551.3 72 Sharma, V.K., 2010. Introduction to process geomorphology. CRC Press. Scitech, 551.41 113

GEOS2916
Earth Surface Processes (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x3-hr practical (lab/computer) sessions each week **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GEOS2116 or GEOG2321 **Assessment:** practical and research assignments, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The surface of the planet on which you live is the product of a balance between tectonic forces and numerous agents of erosion. The landscapes in which you live and work, and from which you draw resources, are therefore the legacy of many processes operating synchronously over long time periods. It is also true that Earth's landscapes are dynamic, and constantly changing around you in response to climate, tectonics and patterns of life. The sustainable management of landscapes is strongly dependent upon an awareness of those processes and the ways that they constrain human-environment interactions. In the Advanced mode of Earth Surface Processes, you will learn how landscapes are produced, and what this means for contemporary land use. Lectures by experts in physical geography, geology, soil science and environmental science will introduce you to the planetary and regional-scale controls on landforms and landscape dynamics, and the nature and distribution of major Australian landscape types. Focussed around 'hands on' field and laboratory-based tasks, students will gain essential practical, analytical and interpretive skills in the analysis of landscapes and earth surface processes that shape them. The Advanced mode of Earth Surface Processes challenges you to create new knowledge, and provides a higher level of academic rigour. You will take part in a series of small-group practical exercises that will develop your skills in research design and execution, and will provide you with a greater depth of understanding in core aspects of geomorphology. The Advanced mode will culminate in a research-focussed Advanced Assignment. This is a unit for anyone wanting to better understand the planet on which they live, and who may wish to develop higher-level analytical and research skills in geomorphology and landscape analysis.

Textbooks

Allen, P.A., 2009. Earth surface processes. John Wiley and Sons. Scitech, 551.3 72 Sharma, V.K., 2010. Introduction to process geomorphology. CRC Press. Scitech, 551.41 113

SOIL2005
Soil and Water: Earth's Life Support Systems

Credit points: 6 **Teacher/Coordinator:** Prof Balwant Singh **Session:** Semester 1 **Classes:** Lectures: 3 hours per week; lab: 3 hours per week for 10 weeks **Prohibitions:** SOIL2003 or LWSC2002 **Assessment:** Field excursion: attendance and creative assessment (5%), the attendance at the excursion is complusory to get any mark for this assessment task; quiz: (10%); written assignment: modelling assessment including modelling (15%); laboratory report: group oral presentation and written assignment (20%); final exam: final written exam (50%) **Practical field work:** Approximately eight hours working field at Cobbitty Farm Wk 0 (Friday, 2 March 2018) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Soil and water are the two most essential natural resources on the Earth's surface which influence all forms of terrestrial life. This unit of study is designed to introduce students to the fundamental properties and processes of soil and water that affect food security and sustain ecosystems. These properties and processes are part of the grounding principles that underpin crop and animal production, nutrient and water cycling, and environmental sustainability. You will participate in a field excursion to examine soils in a landscape to develop knowledge and understanding of soil properties, water storage, water movement and cycling of organic carbon and nutrients in relation to food production and ecosystem functioning. At the end of this unit you will be able to articulate and quantify the factors and processes that determine the composition and behaviour of soil, composition of water, soil water storage and the movement of water on the land surface. You will also be able to describe the most important properties of soil and water for food production and sustaining ecosystem functions and link this to human and climatic factors. The field excursion, report and laboratory/computer exercises have been designed to develop communication, team work and collaborative efforts.

Textbooks

Brady, N.C. and Ray R. Weil. (2007). The Nature and Properties of Soils. 14th Edition, Prentice Hall, New Jersey. White, R.E. (2006) Principles and Practice of Soil Science: the Soil as a Natural Resource. 4th ed., Blackwell Science, Oxford. Diana H. Wall, Richard D. Bardgett, Valerie Behan-Pelletier, Jeffrey E. Herrick, T. Hefin Jones, Karl Ritz, Johan Six, Donald R. Strong, and Wim H. van der Putten (Eds.) (2012). Soil Ecology and Ecosystem Services. Oxford University Press, ISBN: 9780199575923. Kutllek, M and Nielsen, D.R. (2015). Soil: The Skin of the Planet Earth, Springer, ISBN: 978-94-017-9788-7 (Print) 978-94-017-9789-4 (Online). Gordon, N. D., McMahon, T. A., Finlayson, B. L., Gippel, C. J., and Nathan, R. J. (2004) Stream Hydrology: an Introduction for Ecologists, John Wiley and Sons Inc.

3000-level units of study

Major core

LWSC3007
Advanced Hydrology and Modelling

Credit points: 6 **Teacher/Coordinator:** A/Prof Willem Vervoort (Coordinator), Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** 2-hour lecture per week, 3-hour practical per week **Prerequisites:** LWSC2002 **Assessment:** Four practical assessments and reports (50%), take-home exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to allow students to examine advanced hydrological modeling focusing on catchment level responses and uncertainty. Students will learn how to develop their own simulation model of catchment hydrological processes in R and using SWAT and review the possibilities and impossibilities of using simulation models for catchment management. Students will further investigate landuse change impacts and climate change impacts the variability in hydrological responses. At the end of this unit, students will be able to calibrate and evaluate a catchment model, articulate advantages and disadvantages of using simulation models for catchment management, justify the choice of a simulation model for a particular catchment management problem, identify issues in relation to uncertainty in water quality and quantity The students will gain research and inquiry skills through research based assignments, information literacy and communication skills through laboratory reports and a presentation and personal and intellectual autonomy through working in groups.

Textbooks

Textbooks (Recommended reading)
Beven, K.J. Rainfall-Runoff modeling, The Primer, John Wiley and Sons, Chichester, 2001

ENVX3001
Environmental GIS

Credit points: 6 **Teacher/Coordinator:** A/Prof Inakwu Odeh **Session:** Semester 2 **Classes:** Three-day field trip, (two lectures and two practicals per week) **Prerequisites:** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX **Assessment:** One 15-minute presentation (10%), 3500wd prac report (35%), 1500wd report on trip excursion (15%), 2-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to impart knowledge and skills in spatial analysis and geographical information science (GISc) for decision-making in an environmental context. The lecture material will present several themes: principles of GISc, geospatial data sources and acquisition methods, processing of geospatial data and spatial statistics. Practical exercises will focus on learning geographical information systems (GIS) and how to apply them to land resource assessment, including digital terrain modelling, land-cover assessment, sub-catchment modelling, ecological applications, and soil quality assessment for decisions regarding sustainable land use and management. A three day field excursion during the mid-semester break will involve a day of GPS fieldwork at Arthursleigh University farm and two days in Canberra visiting various government agencies which research and maintain GIS coverages for Australia. By the end of this UoS, students should be able to: differentiate between spatial data and spatial information; source geospatial data from government and private agencies; apply conceptual models of spatial phenomena for practical decision-making in an environmental context; apply critical analysis of situations to apply the concepts of spatial analysis to solving environmental and land resource problems; communicate effectively results of GIS investigations through various means- oral, written and essay formats; and use a major GIS software package such as ArcGIS.

Textbooks

Burrough, P.A. and McDonnell, R.A. 1998. Principles of Geographic Information Systems. Oxford University Press: Oxford.
Clarke, K. C. 2003. Getting Started With Geographic Information Systems. 4th Edition. Prentice Hall: Upper Saddle River, New Jersey.

SOIL3011 to be developed for offering in 2019.

Major selective

ENVX3002
Statistics in the Natural Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** one 2-hour workshop per week, one 3-hour computer practical per week **Prerequisites:** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 **Assessment:** One exam during the exam period (50%), five assessment tasks (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Interdisciplinary Unit

This unit of study is designed to introduce students to the analysis of data they may face in their future careers, in particular data that are not well behaved. The data may be non-normal, there may be missing observations, they may be correlated in space and time or too numerous to analyse with standard models. The unit is presented in an applied context with an emphasis on correctly analysing authentic datasets, and interpreting the ouput. It begins with the analysis and design experiments based on the general linear model. In the second part, students will learn about the generalisation of the general linear model to accommodate non-normal data with a particular emphasis on the binomial and poisson distributions. In the third part linear mixed models will be introduced which provide the means to analyse datasets that do not meet the assumptions of independent and equal errors, for example data that is correlated in space and time. The units ends with an introduction to machine learning and predictive modelling. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

GEOS3X19 to be developed for offering in 2019.

Minor core

LWSC3007
Advanced Hydrology and Modelling

Credit points: 6 **Teacher/Coordinator:** A/Prof Willem Vervoort (Coordinator), Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** 2-hour lecture per week, 3-hour practical per week **Prerequisites:** LWSC2002 **Assessment:** Four practical assessments and reports (50%), take-home exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to allow students to examine advanced hydrological modeling focusing on catchment level responses and uncertainty. Students will learn how to develop their own simulation model of catchment hydrological processes in R and using SWAT and review the possibilities and impossibilities of using simulation models for catchment management. Students will further investigate landuse change impacts and climate change impacts the variability in hydrological responses. At the end of this unit, students will be able to calibrate and evaluate a catchment model, articulate advantages and disadvantages of using simulation models for catchment management, justify the choice of a simulation model for a particular catchment management problem, identify issues in relation to uncertainty in water quality and quantity The students will gain research and inquiry skills through research based assignments, information literacy and communication skills through laboratory reports and a presentation and personal and intellectual autonomy through working in groups.

Textbooks

Textbooks (Recommended reading)
Beven, K.J. Rainfall-Runoff modeling, The Primer, John Wiley and Sons, Chichester, 2001

SOIL3011 to be developed for offering in 2019.

Statistics

Statistics is a major offered by the School of Mathematics and Statistics. Units of study in this major are available at standard and advanced level.

About the major

Statistics is pervasive in all areas of the sciences, the social sciences, finance and business, and is the key paradigm used to assess the strength of evidence from all kinds of data. In a statistics major, students learn about theoretical, computational, and applied statistics, and probability theory. As part of the major students will apply the techniques that they learn to a variety of applications. Students learn about quantifying uncertainty, experimental design, probabilistic modelling and the latest techniques in statistical and machine learning. This major is essential training if you wish to become a professional statistician.

The 1000-level units of study cover a range of topics in mathematics and statistics and are offered at several levels, viz. Introductory, Fundamental, Regular, Advanced, and Special Studies, to suit various levels of previous knowledge. 2000-level, 3000-level and Honours (4XXX) units of study are mostly provided within one of the subject areas of applied mathematics, mathematical statistics and pure mathematics.

Advanced level units have more stringent prerequisites than regular units, and are significantly more demanding. Although the precise requirements vary from unit to unit, it is generally inadvisable for a student who has not achieved a Credit average in 2000-level mathematics to attempt an advanced 3000-level mathematics unit.

Various combinations of 1000-level units of study may be taken, subject to the prerequisites listed. Often specific 1000-level units of study are prerequisites for mathematics and statistics units at the 2000 and 3000-levels. Before deciding on a particular combination of 1000-level units of study, students are advised to check carefully the prerequisites relating to mathematics for all units of study.

The precise requirements for this major can be found in Table A. Alternatively, consult the school directly.

Requirements for completion

A major in Statistics requires 48 credit points, consisting of:

(i)12 credit points of 1000-level units according to the following rules:

- 6 credit points of calculus and 3 credit points of linear algebra and 3 credit points of statistics; or
- 3 credit points of calculus and 3 credit points of linear algebra and 6 credit points of data science

(ii)12 credit points of 2000-level core units
(iii)12 credit points of 3000-level core units
(iv)12 credit points of 3000-level selective units

A minor in Statistics is available and articulates to this major.

First year

Option A: (MATH1XX1 and MATH1XX3 and MATH1X02/1014 and MATH1XX5)
Or
Option B: ((MATH1XX1 or MATH1XX3) and MATH1X02/1014 and DATA1001).

Second year

Core: STAT2X11 and DATA2002/STAT2912.

Third year

STAT3X22, STAT3X23 and 6 credit points from a selection of: STAT3021 and STAT3024.
In your third year, you must take at least one designated project unit.

Fourth year

The fourth year is only offered within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Advanced Coursework
The Bachelor of Advanced Studies advanced coursework option consists of 48 credit points, which must include a minimum of 24 credit points in a single subject area at 4000 level, including a project unit of study worth at least 12 credit points. Space is provided for 12 credit points towards the second major (if not already completed). 24 credit points of advanced study will be included in the table for 2020.

Honours
Requirements for Honours in the area of Statistics: completion of 24 credit points of project work and 24 credit points of coursework.

Honours units of study will be available in 2020.

Contact and further information

W www.maths.usyd.edu.au/

First year enquiries email: firstyear@maths.usyd.edu.au
Other undergraduate enquiries email: ug-enq@maths.usyd.edu.au
All inquiries phone: +61 2 9351 5804 or +61 2 9351 5787

Address:
School of Mathematics and Statistics
School of Mathematics, Level 5, Carslaw Building
University of Sydney NSW 2006

Dr Michael Stewart
E michael.stewart@sydney.edu.au
T +61 2 9351 5765

Learning Outcomes

Students who graduate from Statistics will be able to demonstrate:

1. Effective communication of statistical concepts, methodology and results to a diverse range of audiences, from the general public to a scientifically educated audience.
2. A deep understanding of the theoretical underpinnings of probability theory and statistics.
3. The ability to identify and apply correct techniques to analyse data and to prepare data for analysis, when needed.
4. A broad understanding of statistical principals for the design of experiments.
5. An intuitive understanding of principals of decision making under uncertainty and a broad understanding of the types of questions that can be answered with a given set of data.
6. The ability to use descriptive, interpretive and exploratory analysis of data by graphical and visualization tools as well as other methods.
7. An understanding of statistical reasoning and inferential methods including the theory of maximum likelihood estimation, the framework of statistical hypothesis testing and common statistical procedures.
8. The ability to formulate statistical questions in a disciplinary context, determine appropriate statistical modelling and model fitting, and understand the limitations of such approaches.
9. Confidence with statistical computing and knowledge in using a range of statistical programming languages and computational resources.
10. The ability to work in a team that includes both members with statistical expertise and members with expertise in other disciplines, but limited statistical expertise.

Statistics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
STATISTICS Advanced coursework and projects will be available in 2020 for students who complete this major.			
Statistics major A major in Statistics requires 48 credit points from this table including: (i) 12 credit points of 1000-level units according to the following rules: (a) 6 credit points of calculus and 3 credit points of linear algebra and 3 credit points of statistics; or (b) 3 credit points of calculus and 3 credit points of linear algebra and 6 credit points of data science (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units (iv) 12 credit points of 3000-level selective units			
Statistics minor A minor in Statistics requires 36 credit points from this table including: (i) 12 credit points of 1000-level units according to the following rules: (a) 6 credit points of calculus and 3 credit points of linear algebra and 3 credit points of statistics; or (b) 3 credit points of calculus and 3 credit points of linear algebra and 6 credit points of data science (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Calculus units			
MATH1021 **Calculus Of One Variable**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931	Semester 1
MATH1921 **Calculus Of One Variable (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 *Note: Department permission required for enrolment*	Semester 1
MATH1931 **Calculus Of One Variable (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 1
MATH1011 **Applications of Calculus**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1001 or MATH1901 or MATH1906 or MATH1111 or BIOM1003 or ENVX1001 or MATH1021 or MATH1921 or MATH1931	Semester 1 Summer Main
MATH1023 **Multivariable Calculus and Modelling**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933	Semester 2
MATH1923 **Multivariable Calculus and Modelling (Adv)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 *Note: Department permission required for enrolment*	Semester 2
MATH1933 **Multivariable Calculus and Modelling (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 2
Statistics units			
MATH1005 **Statistical Thinking with Data**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020	Semester 2 Summer Main Winter Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MATH1905 **Statistical Thinking with Data (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 *Note: Department permission required for enrolment*	Semester 2
MATH1015 **Biostatistics**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020	Semester 1
Linear algebra units			
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1012 or MATH1014 or MATH1902	Semester 1 Summer Main
MATH1902 **Linear Algebra (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1002 or MATH1012 or MATH1014 *Note: Department permission required for enrolment*	Semester 1
MATH1014 **Introduction to Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1012 or MATH1002 or MATH1902	Semester 2
Data science units			
DATA1001 **Foundations of Data Science**	6	**N** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021	Semester 1 Semester 2
2000-level units of study			
Core			
DATA2002 **Data Analytics: Learning from Data**	6	**A** (Basic Linear Algebra and some coding) or QBUS1040 **P** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **N** STAT2012 or STAT2912	Semester 2
STAT2912 **Statistical Tests (Advanced)**	6	**A** STAT2911 **P** MATH1905 or Credit in MATH1005 or Credit in ECMT1010 or Credit in BUSS1020 **N** STAT2012 or STAT2004 or DATA2002	Semester 2
STAT2011 **Probability and Estimation Theory**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **N** STAT2901 or STAT2001 or STAT2911	Semester 1
STAT2911 **Probability and Statistical Models (Adv)**	6	**P** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **N** STAT2001 or STAT2901 or STAT2011	Semester 1
3000-level units of study			
Major core			
STAT3X22 and STAT3X23 to be developed for offering in 2019.			
Major selective			
STAT3021 and STAT3024 to be developed for offering in 2019.			
Minor selective			
STAT3021, STAT3X22, STAT3X23 and STAT3024 to be developed for offering in 2019.			

Statistics

STATISTICS

Advanced coursework and projects will be available in 2020 for students who complete this major.

Statistics major

A major in Statistics requires 48 credit points from this table including: (i) 12 credit points of 1000-level units according to the following rules:(a) 6 credit points of calculus and 3 credit points of linear algebra and 3 credit points of statistics; or(b) 3 credit points of calculus and 3 credit points of linear algebra and 6 credit points of data science (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level core units (iv) 12 credit points of 3000-level selective units

Statistics minor

A minor in Statistics requires 36 credit points from this table including: (i) 12 credit points of 1000-level units according to the following rules:(a) 6 credit points of calculus and 3 credit points of linear algebra and 3 credit points of statistics; or(b) 3 credit points of calculus and 3 credit points of linear algebra and 6 credit points of data science (ii) 12 credit points of 2000-level core units (iii) 12 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Calculus units

MATH1021
Calculus Of One Variable

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals.

Textbooks
As set out in the Junior Mathematics Handbook.

MATH1921
Calculus Of One Variable (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals. Additional theoretical topics included in this advanced unit include the Intermediate Value Theorem, Rolle's Theorem, and the Mean Value Theorem.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1931
Calculus Of One Variable (SSP)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1921 Calculus of One Variable (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

MATH1011
Applications of Calculus

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1001 or MATH1901 or MATH1906 or MATH1111 or BIOM1003 or ENVX1001 or MATH1021 or MATH1921 or MATH1931 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed for science students who do not intend to undertake higher year mathematics and statistics. It establishes and reinforces the fundamentals of calculus, illustrated where possible with context and applications. Specifically, it demonstrates the use of (differential) calculus in solving optimisation problems and of (integral) calculus in measuring how a system accumulates over time. Topics studied include the fitting of data to various functions, the interpretation and manipulation of periodic functions and the evaluation of commonly occurring summations. Differential calculus is extended to functions of two variables and integration techniques include integration by substitution and the evaluation of integrals of infinite type.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1023
Multivariable Calculus and Modelling

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1923
Multivariable Calculus and Modelling (Adv)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable. Additional topics covered in this advanced unit of study include the use of diagonalisation of matrices to study systems of linear equation and optimisation problems, limits of functions of two or more variables, and the derivative of a function of two or more variables.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1933
Multivariable Calculus and Modelling (SSP)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1923 Multivariable Calculus and Modelling (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

Statistics units

MATH1005
Statistical Thinking with Data

Credit points: 3 **Session:** Semester 2, Summer Main, Winter Main **Classes:** Lectures 2 hrs/week; Practical 1 hr/week **Prohibitions:** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In a data-rich world, global citizens need to problem solve with data, and evidence based decision-making is essential is every field of research and work.

This unit equips you with the foundational statistical thinking to become a critical consumer of data. You will learn to think analytically about data and to evaluate the validity and accuracy of any conclusions drawn. Focusing on statistical literacy, the unit covers foundational statistical concepts, including the design of experiments, exploratory data analysis, sampling and tests of significance.

Textbooks
Freedman, Pisani and Purves, Statistics, Norton, 2007

MATH1905
Statistical Thinking with Data (Advanced)

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. This Advanced level unit of study parallels the normal unit MATH1005 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1015
Biostatistics

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1015 is designed to provide a thorough preparation in statistics for students in the Biological and Medical Sciences. It offers a comprehensive introduction to data analysis, probability and sampling, inference including t-tests, confidence intervals and chi-squared goodness of fit tests.

Textbooks
As set out in the Junior Mathematics Handbook

Linear algebra units

MATH1002
Linear Algebra

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1014 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1002 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study introduces vectors and vector algebra, linear algebra including solutions of linear systems, matrices, determinants, eigenvalues and eigenvectors.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1902
Linear Algebra (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1002 or MATH1012 or MATH1014 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. It parallels the normal unit MATH1002 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1014
Introduction to Linear Algebra

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1002 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **Assessment:** One 1.5 hour exam, assignments, quizzes (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an introduction to Linear Algebra. Topics covered include vectors, systems of linear equations, matrices, eigenvalues and eigenvectors. Applications in life and technological sciences are emphasised.

Textbooks

As set out in the Junior Mathematics Handbook.

Data science units

DATA1001
Foundations of Data Science

Credit points: 6 **Teacher/Coordinator:** Dr Di Warren **Session:** Semester 1, Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prohibitions:** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021 **Assessment:** assignments, quizzes, presentation, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

DATA1001 is a foundational unit in the Data Science major. The unit focuses on developing critical and statistical thinking skills for all students. Does mobile phone usage increase the incidence of brain tumours? What is the public's attitude to shark baiting following a fatal attack? Statistics is the science of decision making, essential in every industry and undergirds all research which relies on data. Students will use problems and data from the physical, health, life and social sciences to develop adaptive problem solving skills in a team setting. Taught interactively with embedded technology, DATA1001 develops critical thinking and skills to problem-solve with data. It is the prerequisite for DATA2002.

Textbooks

Statistics, Fourth Edition, Freedman Pisani Purves

2000-level units of study

Core

DATA2002
Data Analytics: Learning from Data

Credit points: 6 **Teacher/Coordinator:** Jean Yang **Session:** Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prerequisites:** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **Prohibitions:** STAT2012 or STAT2912 **Assumed knowledge:** (Basic Linear Algebra and some coding) or QBUS1040 **Assessment:** written assignment, presentation, exams **Mode of delivery:** Normal (lecture/lab/tutorial) day

Technological advances in science, business, engineering has given rise to a proliferation of data from all aspects of our life. Understanding the information presented in these data is critical as it enables informed decision making into many areas including market intelligence and science. DATA2002 is an intermediate course in statistics and data sciences, focusing on learning data analytic skills for a wide range of problems and data. How should the Australian government measure and report employment and unemployment? Can we tell the difference between decaffeinated and regular coffee ? In this course, you will learn how to ingest, combine and summarise data from a variety of data models which are typically encountered in data science projects as well as reinforcing their programming skills through experience with statistical programming language. You will also be exposed to the concept of statistical machine learning and develop the skill to analyze various types of data in order to answer a scientific question. From this unit, you will develop knowledge and skills that will enable you to embrace data analytic challenges stemming from everyday problems.

STAT2912
Statistical Tests (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** MATH1905 or Credit in MATH1005 or Credit in ECMT1010 or Credit in BUSS1020 **Prohibitions:** STAT2012 or STAT2004 or DATA2002 **Assumed knowledge:** STAT2911 **Assessment:** One 2-hour exam, assignments and/or quizzes, computer practical reports and one computer practical exam (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an advanced version of STAT2012 with an emphasis on both methods and the mathematical derivation of these methods: Tests of hypotheses and confidence intervals, including t-tests, analysis of variance, regression - least squares and robust methods, power of tests, non-parametric methods, non-parametric smoothing, tests for count data, goodness of fit, contingency tables. Graphical methods and diagnostic methods are used throughout with all analyses discussed in the context of computation with real data using an interactive statistical package.

STAT2011
Probability and Estimation Theory

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory week. **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **Prohibitions:** STAT2901 or STAT2001 or STAT2911 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to univariate techniques in data analysis and the most common statistical distributions that are used to model patterns of variability. Common discrete random models like the binomial, Poisson and geometric, continuous models including the normal and exponential will be studied along with elementary regression models. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2911
Probability and Statistical Models (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **Prohibitions:** STAT2001 or STAT2901 or STAT2011 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an advanced version of STAT2011, with an emphasis on the mathematical techniques used to manipulate random variables and probability models. Common distributions including the Poisson, normal, beta and gamma families as well as the bivariate normal are introduced. Moment generating functions and convolution methods are used to understand the behaviour of sums of random variables. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The notions of conditional expectation and prediction will be covered as will be distributions related to the normal: chi^2, t and F. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

3000-level units of study

Major core

STAT3X22 and STAT3X23 to be developed for offering in 2019.

Major selective

STAT3021 and STAT3024 to be developed for offering in 2019.

Minor selective

STAT3021, STAT3X22, STAT3X23 and STAT3024 to be developed for offering in 2019.

Virology

Study in Virology is offered in partnership between the Discipline of Infectious Diseases and Immunology in the Sydney Medical School and the Discipline of Microbiology in the School of Life and Environmental Sciences in the Faculty of Science. Units of study in this minor are available at standard and advanced level.

About the minor

A minor in Virology will equip you with knowledge and skills relating to the role of viruses in human, animal and plant hosts.

Requirements for completion

A minor in Virology requires 36 credit points, consisting of:

(i)6 credit points of 1000-level core units
(ii)6 credit points of 1000-level selective units
(iii)12 credit points of 2000-level core units
(iv)12 credit points of 3000-level core units

First year

BIOL1XX7 From Molecules to Ecosystems and 6 credit points from a selection of: CHEM1XX1 Chemistry or Human Biology BIOL1XX8 or MEDS1X01 (MEDS1X01 is only available to students enrolled in the Medical Science stream, students outside the Medical Science stream take BIOL1XX8).

Second year

IMMU2101 Introductory Immunology and MICR2X22 Microbes in Society OR for students enrolled in the Medical Science stream only: BMED2404 Microbes, Infection and Immunity and BMED2405 Gut and Nutrient Metabolism.

Third year

Core: VIRO3X01 and VIRO3X02.

In your third year you must take at least one designated project unit.

The final year embraces the study of viral causative agents, outbreak epidemiology and host response. Central to this lies the impacts and outcomes of infection with viral pathogens for humans and other hosts: animals and plants. Even with development of improved treatment and control processes for infectious diseases, viruses remain important pathogens today. Two 3000-level units cover in-depth study of viruses: what they are, their classification, how they replicate, how they infect and damage cells, how hosts respond to viral infection, diagnostic processes and vaccination strategies.

Contact and further information

W sydney.edu.au/medicine/infectious-diseases-immunology/contact/index.php

Address:
Infectious Diseases and Immunology
Level 5 (East), Charles Perkins Centre hub (D17)
University of Sydney NSW 2006

Helen Agus
E helen.agus@sydney.edu.au
T +61 2 9351 6043

Dr Jamie Triccas
E jamie.triccas@sydney.edu.au
T +61 2 9036 6582

Learning Outcomes

Students who graduate from Virology will be able to:

1. Describe the role of viruses as agents of disease, their function in the ecosphere, abundance and diversity
2. Define the key characteristics of the classes of viruses that distinguish them from each other
3. Perform culture, microscopy, diagnostic and molecular techniques used in the modern diagnostic virology laboratory, and explain and critically evaluate the scientific principles behind these important techniques
4. Have a detailed knowledge of virus virulence mechanisms and their role in invasion, establishment and progression of infection
5. Know the major causes of important viral diseases in the general community and hospital environments
6. Explain how viral diseases emerge or re-emerge to impact human and global health
7. Explain the ways in which important viral pathogens pose a challenge for public health
8. Be familiar with the measures that have been developed to control viruses and the conceptual basis of the control strategies
9. Critically evaluate the research literature dealing with pathogenic processes of viruses and epidemiology and apply this knowledge to virology research

Virology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
VIROLOGY			
Virology minor			
The Virology minor articulates to the Infectious Diseases major.			
A minor in Virology requires 36 credit points from this table including: (i) 6 credit points of 1000-level core units (ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units (iv) 12 credit points of 3000-level core units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Selective			
BIOL1008 **Human Biology**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998	Semester 1 Summer Main
BIOL1908 **Human Biology (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1998 **Human Biology (Special Studies Program)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 *Note: Department permission required for enrolment*	Semester 1
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
MEDS1001 **Human Biology**	6	**N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MEDS1901 **Human Biology (Advanced)**	6	**P** 85 or above in HSC Biology or equivalent **N** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 *Note: Department permission required for enrolment*	Semester 1
MEDS coded units of study are only available to students in the Medical Science stream.			
2000-level units of study			
Core			
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
BMED2405 **Gut and Nutrient Metabolism**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
MICR2022 **Microbes in Society**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **N** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
MICR2922 **Microbes in Society (Advanced)**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
MIMI2X02, MEDS2003 and MEDS2004 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).			
3000-level units of study			
Core			
VIRO3001 **Virology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3901 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
VIRO3901 **Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** VIRO3001 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
VIRO3002 **Medical and Applied Virology**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3902 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.*	Semester 2
VIRO3902 **Medical and Applied Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **N** VIRO3002 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.*	Semester 2

Virology

VIROLOGY

Virology minor

The Virology minor articulates to the Infectious Diseases major.A minor in Virology requires 36 credit points from this table including:(i) 6 credit points of 1000-level core units(ii) 6 credit points of 1000-level selective units (iii) 12 credit points of 2000-level core units(iv) 12 credit points of 3000-level core units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

Selective

BIOL1008
Human Biology

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1, Summer Main **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials; students encouraged to spend 1-2 hours per week accessing online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1908 or BIOL1998 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February).

Assessment: Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

BIOL1908
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Osu Lilje **Session:** Semester 1 **Classes:** Lectures; six 3-hour practical sessions; six workshops and tutorials.; in addition, students are strongly encouraged to spend 1-2 hours per week accessing on-line resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1998 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

BIOL1998
Human Biology (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures; 12 3-hour practical sessions; students are strongly encouraged to spend 1-2 hours on online resources **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1991 or BIOL1996 or MEDS1001 or MEDS1901 or BIOL1008 or BIOL1908 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** written and oral presentation, quiz, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences.

Textbooks
TBA

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or

CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

MEDS1001
Human Biology

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus, these contact hours will comprise lectures; six 3-hour practical sessions; six workshops and tutorials **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1901 **Assessment:** Written and oral communication, quiz, practical and workshop reports, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the medical sciences suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology and medical sciences. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in the medical sciences.

Textbooks

TBA

MEDS1901
Human Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Philip Poronnik **Session:** Semester 1 **Classes:** this unit of study will involve between 5-6 hours of face-to-face activities run on the camperdown campus **Prerequisites:** 85 or above in HSC Biology or equivalent **Prohibitions:** BIOL1003 or BIOL1903 or BIOL1993 or BIOL1008 or BIOL1908 or BIOL1998 or MEDS1001 **Assessment:** Written and oral presentation, quiz, assignment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

What will it mean to be human in 2100? How will we be able to control our complex bodily mechanisms to maintain health and fight disease? Advances in the human biology suggest we will age more slowly and new technologies will enhance many bodily structures and functions. This unit of study will explore maintenance of health through nutritional balance, aerobic health, defence mechanisms and human diversity. You will learn key structural features from the subcellular level to the whole organ and body, and learn about essential functional pathways that determine how the body regulates its internal environment and responds to external stimuli and disease. Together we will investigate nutrition, digestion and absorption, cardiovascular and lung function, reproduction, development, epigenetics, and regulation of function through various interventions. You will receive lectures from experts in the field of human biology and medical sciences, supported by practical classes, workshops and on-line resources that leverage off state-of-the-art technologies to develop your practical, critical thinking, communication, collaboration, digital literacy, problem solving, and enquiry-based skills in human biology. This unit of study will provide you with the breadth and depth of knowledge and skills for further studies in majors in medical sciences. The advanced unit has the same overall concepts as the mainstream unit but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in the advanced stream will participate in alternative components which may for example include guest lecturers from medical science industries. The nature of these components may vary from year to year.

Textbooks
TBA

MEDS coded units of study are only available to students in the Medical Science stream.

2000-level units of study

Core

BMED2404
Microbes, Infection and Immunity

Credit points: 6 **Teacher/Coordinator:** Dr Jim Manos **Session:** Semester 2 **Classes:** Two lectures and one practical per week, two tutorials **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), in-semester assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study begins by introducing the concepts of disease transmission, pathogenicity and virulence mechanisms of microbes. For a full understanding of the process of infection, the structure and function of pathogenic microorganisms is examined. How the body deals with injury and infection is discussed by exploring barriers to infection and host response once those barriers are breached. The body's response to such physical damage is dealt with in a series of lectures on wound healing, clotting and inflammation, and is complemented by discussion of the pharmacological basis of anti-inflammatory drugs. This is followed by a comprehensive discussion of molecular and cellular immune responses to pathogen invasion. In particular, this gives students an appreciation of the processing of antigens, the structure, production and diversity of antibodies, the operation of the complement system and mechanisms for recognition and destruction of invading microbes. The unit concludes with an overview of microbial diseases, the characteristics of causative agents, pathogenesis and symptoms as well as treatment and control and culminates with exploring current issues of antibiotic resistance, important emerging infections and vaccination strategies.

Practical classes illustrate and underpin the lecture content. Students will investigate normal flora, host defences and medically important microbes and will obtain experience in, and an understanding of, a range of techniques in bacteriology. In these practical sessions experience will be gained handling live, potentially pathogenic microbes.

Textbooks
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
Basic Immunology: Functions and Disorders of the Immune System. Abass AK and Lichtman AH WB Saunders, 4th Edition, 2013
Robbins Basic Pathology Kumar V, Abbas AK and Aster J Saunders, Philadelphia, 9th Edition, 2013

BMED2405
Gut and Nutrient Metabolism

Credit points: 6 **Teacher/Coordinator:** A/Prof Charles Collyer **Session:** Semester 2 **Classes:** Two lectures and one tutorial or one practical session per week **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), five in-semester assignments/assessments (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines in detail the anatomy of the gastrointestinal tract, from the oral cavity to anal canal, and includes the liver, gallbladder and pancreas. This is complemented by description of the specialised cells in the gastrointestinal tract, followed by discussion of the transport mechanisms employed to absorb nutrients, and consideration of control systems used to regulate activity of the digestive process. The role of intestinal microflora in the gastrointestinal tract, contributing to both beneficial digestion and absorption of nutrients, as well as to pathogenic disruption, is also discussed. The fate of the macronutrients (carbohydrate, fat and protein) is then considered in terms of their uptake, disposal and reassembly into storage fuels and cellular structures. The biochemical pathways involved in the extraction of energy from the macronutrient fuels are then covered. Examples of these metabolic processes are provided by considering fuel selection during starvation and in diabetes. Finally, pharmacokinetics and pharmacogenomics are explored, with discussion of the metabolism and absorption of drugs including detoxification and excretion of xenobiotic compounds. Practical classes give students extensive experience with inspection of the gastrointestinal system at both the cellular and gross anatomical levels, and in theassay of biochemicals such as glucose. These sessions are designed to nurture observation, data analysis, record keeping and report writing skills.

Textbooks
Human Physiology: An integrated approach Silverthorn D Pearson/Benjamin Cummings, 6th Edition, 2013
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
The Anatomy Coloring Book Kapit W and Elson LM Benjamin Cummings, 4th Edition, 2014
Histology: A text and Atlas Ross MH and Pawlina W Lippincott, Williams and Wilkins, 7th Edition, 2015
Medical Pharmacology at a Glance Neal MJ Blackwell Science, 7th Edition, 2012
Textbook of Biochemistry with Clinical Correlations Devlin TM John Wiley and Sons Inc., 7th Edition, 2011

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1

Assessment: Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks

Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

MICR2022
Microbes in Society

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials per semester. Eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **Prohibitions:** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, two assignments, one quiz, one practical exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

Pathogenic microbes cause infectious diseases of humans, animals and plants, and inflict enormous suffering and economic losses. Beneficial microbes are important contributors to food production, agriculture, biotechnology, and environmental processes. The aims of MICR2022/2922 are to explore the impacts and applications of microbes in human society and in the environment at large, and to teach skills and specialist knowledge in several key areas of microbiology. Medical Microbiology lectures will cover bacterial, viral, and fungal pathogens, and will introduce the concepts of epidemiology, transmission, pathogenicity, virulence factors, host/parasite relationships, host defences, prevention of disease, and antibiotic types, functions, and resistance. Lecture topics in other areas include Food (preservation, spoilage, poisoning, industrial context), Industrial (fermentation, traditional and recombinant products, bioprospecting), Environmental (nutrient cycles, atmosphere, wastewater, pollution, biodegradation) and Agricultural (nitrogen fixation, plant pathogens, biocontrol) microbiology. The laboratory sessions are integrated with the lecture series and are designed to give students practical experience in isolating, identifying and manipulating live potentially pathogenic microorganisms.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

MICR2922
Microbes in Society (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials, three 1-hour seminars and eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, one assignment, one quiz, one practical exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

This unit of study is based on MICR2022. A science communication exercise is unique to MICR2922 and consists of three small group sessions exploring how recent advances in microbiology are communicated to the wider public. This advanced component replaces one assignment exercise from the practical class and is assessed as short essay. The content and nature of this component is based on recent publications with potential high impact for society.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

MIMI2X02, MEDS2003 and MEDS2004 to be developed for offering in 2019 (MEDS coded units of study are only available to students in the Medical Science stream).

3000-level units of study

Core

VIRO3001
Virology

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 26 1-hour lectures, seven 4-hour practical classes, one 2-hour tutorial **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3901 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam (60%) (120 minutes). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novel vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluorescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Tutorials cover a range of topical issues and provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of

Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3901
Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 29 1-hour lectures, seven 4-hour practical classes, four 1-hour tutorials **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** VIRO3001 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), individual presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam: (60%) (120 minutes) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Intermediate Microbiology and is based on VIRO3001 with additional lectures related to the research interests in the Discipline. Consequently, the unit of study content may change from year to year. Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novle vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluroescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Advanced lectures cover cutting-edge research in the field of virology in small group discussions and presentations that provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3002
Medical and Applied Virology

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1-hour lectures per week **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3902 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment and oral presentation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. Practical session slots are also used for oral presentations. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.

This unit of study explores diseases in human caused by viruses, with focus on the way viruses infect individual patients and spread in the community, and how virus infections are diagnosed, treated and/or prevented. Host/Virus interactions will also be described with a focus on the viral mechanisms that have evolved to combat and/or evade host defence systems. These features will be used to explain the symptoms, spread and control of the most medically important viruses that cause serious disease in humans . The unit will be taught by the Discipline of Infectious Diseases and Immunology within the Sydney Medical School with the involvement of associated clinical and research experts who will contribute lectures on their own special interests and with contributions from the Discipline of Microbiology. In the practical classes students will have the opportunity to develop their skills in performing methods currently used in diagnostic and research laboratories such as molecular analysis of viral genomes, immunofluorescent staining of viral antigens, cell culture and the culture of viruses.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3902
Medical and Applied Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, and one interactive 2-hour tutorials (approx 6 in total, including for oral presentations) **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **Prohibitions:** VIRO3002 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment, oral presentation and tutorial participation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.

This unit is based on the VIRO3002 course with inclusion of tutorials, including with leading research medical virologists, enabling students to gain additional experience with cutting edge virology research. The content of this unit may change from year to year based on research interests within the department.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

Wildlife Conservation

Study in Wildlife Conservation is offered by the School of Life and Environmental Sciences. Units of study in this minor are mostly available at standard and advanced level.

About the minor

The fields of Ecology and Evolution intersect at multiple levels and are critically relevant to real-world challenges, including Wildlife Conservation. Students will learn explicitly about evolutionary and ecological processes and how these influence the population dynamics of animals, plants, and other organisms. This knowledge forms the basis for the effective management and conservation of biodiversity, ecosystems, and habitats.

Requirements for completion

A minor in Wildlife Conservation requires 36 credit points, consisting of:

(i)12 credit points of 1000-level core units
(ii)12 credit points of 2000-level core units
(iii)6 credit points of 3000-level core units
(iv)6 credit points of 3000-level selective units

First year

The core units in first year Biology, Life and Evolution (BIOL1XX6) and From Molecules to Ecosystems (BIOL1XX7), provide students with an understanding of the concepts that are central to Wildlife Conservation. These units will provide a broader context within which these concepts can be interpreted, including the scientific framework, hypothesis testing, and experimental design. First year Biology units also provide sufficient background in (bio)chemistry for this major.

Second year

In the second year, Biology Experimental Design and Analysis (BIOL2X22) provides students with sufficient background to design complex ecological and evolutionary experiments in the field, including multifactorial experiments, and to analyse and interpret their data. Ecology and Conservation (BIOL2X24) builds on the broad introduction to Wildlife Conservation in the first year.

Third year

AVBS3004 and 6 credit points from a selection of: BIOL3X07 and BIOL3034

In the third year there will be selective units on Ecology (BIOL3X07) and Australian Biodiversity and Systematics (BIOL3X34). Throughout, there will be emphasis on experimental design and analysis, building on the material taught in the second year.

Contact and further information

W sydney.edu.au/science/life-environment/
E soles.teaching@sydney.edu.au
T +61 2 9036 5417

Address:
School of Life and Environmental Sciences
Level 5, Carslaw Building F07
University of Sydney NSW 2006

Associate Professor Dieter Hochuli
E dieter.hochuli@sydney.edu.au
T +61 2 9351 3992

Learning Outcomes

Students who graduate from Wildlife Conservation will be able to:

1. Use biological language to discuss, explain and apply ecological and evolutionary processes and their role in wildlife conservation.
2. Independently identify and interpret ecological and evolutionary literature.
3. Use statistical tools and concepts to analyse and interpret ecological and evolutionary data.
4. Describe and explain the meaning of ecological and evolutionary experimental results within the context of the current literature.
5. Communicate the objectives and hypotheses being tested in experimental investigations.
6. Create coherent arguments in oral presentations and written reports using evidence from experiments and the literature.
7. Analyse the effectiveness of species conservation strategies and conflicts from multiple perspectives.
8. Analyse conservation issues using ecological and evolutionary principles from individual species to global populations and communities.

Wildlife Conservation

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
WILDLIFE CONSERVATION			
Wildlife Conservation minor			
This minor articulates to the Ecology and Evolutionary Biology major.			
A minor in Wildlife Conservation requires 36 credit points from this table including: (i) 12 credit points of 1000-level core units (ii) 12 credit points of 2000-level core units (iii) 6 credit points of 3000 level core units (iv) 6 credit points of 3000-level selective units			
Units of study			
The units of study are listed below.			
1000-level units of study			
Core			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
2000-level units of study			
Core			
BIOL2022 **Biology Experimental Design and Analysis**	6	**A** BIOL1XXX or MBLG1XXX **P** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **N** BIOL2922 or BIOL3006 or BIOL3906	Semester 2
BIOL2922 **Biol Experimental Design and Analysis Adv**	6	**A** BIOL1XXX or MBLG1XXX **P** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **N** BIOL2022 or BIOL3006 or BIOL3906	Semester 2
BIOL2024 **Ecology and Conservation**	6	**A** BIOL1XXX or MBLG1XXX **N** BIOL2924	Semester 2
BIOL2924 **Ecology and Conservation (Advanced)**	6	**A** BIOL1XXX or MBLG1XXX **P** An annual average mark of at least 70 in the previous year **N** BIOL2024	Semester 2
3000-level units of study			
Core			
AVBS3004 to be developed for offering in 2019.			
Selective			
BIOL3007 **Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3907	Semester 2
BIOL3907 **Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3007	Semester 2
BIOL3034 to be developed for offering in 2019.			

Wildlife Conservation

WILDLIFE CONSERVATION

Wildlife Conservation minor

This minor articulates to the Ecology and Evolutionary Biology major.A minor in Wildlife Conservation requires 36 credit points from this table including:(i) 12 credit points of 1000-level core units(ii) 12 credit points of 2000-level core units (iii) 6 credit points of 3000 level core units(iv) 6 credit points of 3000-level selective units

Units of study

The units of study are listed below.

1000-level units of study

Core

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit

will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

2000-level units of study

Core

BIOL2022
Biology Experimental Design and Analysis

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **Prohibitions:** BIOL2922 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides foundational skills essential for doing research in biology and for critically judging the research of others. We consider how biology is practiced as a quantitative, experimental and theoretical science. We focus on the underlying principles and practical skills you need to explore questions and test hypotheses, particularly where background variation (error) is inherently high. In so doing, the unit provides you with an understanding of how biological research is designed, analysed and interpreted using statistics. Lectures focus on sound experimental and statistical principles, using examples in ecology and other fields of biology to demonstrate concepts. In the practical sessions, you will design and perform, analyse (using appropriate statistical tools) and interpret your own experiments to answer research questions in topics relevant to your particular interest. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks
Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and M. J. Keough. 2002. Experimental Design and Data Analysis for Biologists. 1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2922
Biol Experimental Design and Analysis Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **Prohibitions:** BIOL2022 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2922 will be based on BIOL2022 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and Keough, 2002. Experimental Design and Data Analysis for Biologists.1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2024
Ecology and Conservation

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prohibitions:** BIOL2924 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines the ecological principles driving the major ecosystems of the world and ecological processes behind the world's major conservation issues. It aims to develop in students the core foundations for an understanding of Ecology and its application in conservation. Lectures will focus on the ecology of the major terrestrial and marine biomes of the world. Application of ecological theory and methods to practical conservation problems will be integrated throughout the unit of study. Practical sessions will provide hands-on experience in ecological sampling and data handling to understand the ecology of marine and terrestrial environments, as well as ecological simulations to understand processes. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John
Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

BIOL2924
Ecology and Conservation (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An annual average mark of at least 70 in the previous year **Prohibitions:** BIOL2024 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2924 will be based on BIOL2024 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John
Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

3000-level units of study

Core

AVBS3004 to be developed for offering in 2019.

Selective

BIOL3007
Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3907 **Assessment:** One 2-hour exam, group presentations, one essay, one project report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the dynamics of ecological systems, and considers the interactions between individual organisms and populations, organisms and the environment, and ecological processes. Lectures are grouped around four dominant themes: Interactions, Evolutionary Ecology, The Nature of Communities, and Conservation and Management. Emphasis is placed throughout on the importance of quantitative methods in ecology, including sound planning and experimental designs, and on the role of ecological science in the conservation, management, exploitation and control of populations. Relevant case studies and examples of ecological processes are drawn from marine, freshwater and terrestrial systems, with plants, animals, fungi and other life forms considered as required. Students will have some opportunity to undertake short term ecological projects, and to take part in discussions of important and emerging ideas in the ecological literature.

Textbooks

Begon M, Townsend CR, Harper JL (2005) Ecology, From individuals to ecosystems. Wiley-Blackwell.

BIOL3907
Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two lectures per week, weekly tutorial and 3-hour practical per week **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3007 **Assessment:** One 2-hour exam, presentations, one essay, one project report (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as BIOL3007 Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study participate in alternatives to some elements of the standard course and will be encouraged to pursue the objectives by more independent means in a series of research tutorials. Specific details of this unit of study and assessment will be announced in meetings with students in week 1 of semester 2. This unit of study may be taken as part of the BSc (Advanced) program.

Textbooks

As for BIOL3007

BIOL3034 to be developed for offering in 2019.

Honours

Honours is available to meritorious students in degrees administered by the Faculty of Science.

The requirements for admission into Honours differ between degrees, and the intending Honours student is advised to consult both the Faculty resolutions and the specific course resolutions for information about entry and progression requirements for Honours in their particular degree. Where information is not provided in the course resolutions, then please refer to the Faculty resolutions for further information. Students are also required to consult with the Honours coordinator in the relevant School or disciplinary area.

Students who commence from 2018 will only be able to complete Honours within the combined Bachelor of Science/Bachelor of Advanced Studies course.

Environmental Systems (Honours)

Unit of study table

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
The Honours Year will have the following 48 credit point structure:			
AFNR4101 **Research Project A**	12	**P** 144 credit points of level 1000-3000 units of study	Semester 1
ENSY4001 **Scientific Method and Communication**	6	**C** AFNR4101 **N** AFNR5904 or AFNR5901 *Note: Department permission required for enrolment*	Semester 1
AFNR4102 **Research Project B**	12	**P** AFNR4101	Semester 2
And 18 credit points of Year 3 Bachelor of Environmental Systems core units, and elective units from either Table ATS2 or Table NTS2 which have not been previously completed by the candidate and or any other Level 4XXX unit offered by the Faculty subject to Department permission.			

Unit of study descriptions

The Honours Year will have the following 48 credit point structure:

AFNR4101
Research Project A

Credit points: 12 **Teacher/Coordinator:** Prof Budiman Minasny **Session:** Semester 1 **Classes:** No formal classes, approximately 18 hours per week **Prerequisites:** 144 credit points of level 1000-3000 units of study **Assessment:** Research proposal, literature review. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to develop a student's ability to undertake a major research project in an area of specialization. The unit builds on theoretical and applied knowledge gained across most of the units of study undertaken throughout their degree program. This unit is a corequisite with AFNR4102 and each student will work with an academic supervisor in an area of specialization and develop a well defined research project to be executed. The research project is undertaken to advance the students ability to build well-developed research skills, a strong analytical capacity, and the ability to provide high quality research results demonstrating a sound grasp of the research question. Working with an academic supervisor students will develop their ability to define a research project including the producing of testable hypotheses, identifying existing knowledge from reviewing the literature and the design and execution of a research strategy towards solving the research question. Students will build on their previous research and inquiry skills through sourcing a wide range of knowledge to solve the research problem and enhance their intellectual and personal autonomy by means of the development of experimental programs. Students will improve their written and planning skills by composing a research project proposal and the writing of a comprehensive literature review.

ENSY4001
Scientific Method and Communication

Credit points: 6 **Teacher/Coordinator:** A/Prof Damien Field **Session:** Semester 1 **Classes:** One lecture per week, one 3-hour Workshop per week **Corequisites:** AFNR4101 **Prohibitions:** AFNR5904 or AFNR5901 **Assessment:** Submission of four written workshop reports (deconstructing a research proposal, critique of scientific and popular article, from research to publication, scientific poster (Draft)) (4x25%) **Practical field work:** 60 hours preparation for workshops and revision. **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit of study aims to develop a student's ideas about the nature of scientific research, and how it is achieved and the findings communicated. Through attending lectures and workshops students will consider what research is and how it is directed through knowing the scientific method, achieved through good experimental design, and interpreted using critical evaluation. Students will be required to deconstruct and evaluate their research proposals, know what it means to write for the sciences, and how research findings are communicated to the scientific community and wider public. This unit will develop skills in reading scientific literature and the need for a well defines research question and suitable research framework. Students will enhance their intellectual and personal autonomy through evaluating and preparing critiques of research writing and communication.

Textbooks

Bjorn Gustavii, HOW TO WRITE AND ILLUSTRATE A SCIENTIFIC PAPER, 2008, Cambridge

AFNR4102
Research Project B

Credit points: 12 **Teacher/Coordinator:** Prof Budiman Minasny **Session:** Semester 2 **Classes:** No formal classes, approximately 18 hours per week **Prerequisites:** AFNR4101 **Assessment:** Oral presentation, research paper, poster. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is a continuation of the major research project initiated in AFNR4101 and continues to build on theoretical and applied knowledge gained across most of the units of study undertaken throughout their degree program. Working with their academic supervisor in the area of specialization the student will continue to pursue the defined research project towards presenting final results and conclusions. The research results are presented in a format of a research paper as submitted to a research journal. The research paper and corrected literature review is combined and presented together as a thesis. Students will continue to build their research skills, develop strong analytical capacity, demonstrate a sound grasp of the topic, and an ability to interpret results in a broad framework. Working with an academic supervisor students will develop their ability to produce results of high quality, draw reliable conclusions and identify future areas avenues of research. Students will build on their previous research and inquiry skills through sourcing a wide range of knowledge to solve the research problem and enhance their intellectual and personal autonomy by means of the managing the research program. Students will improve their communication skills through oral presentation of their research findings, the production of a poster detailing their research findings and the writing of a research paper.

And 18 credit points of Year 3 Bachelor of Environmental Systems core units, and elective units from either Table ATS2 or Table NTS2 which have not been previously completed by the candidate and or any other Level 4XXX unit offered by the Faculty subject to Department permission.

Science Honours

Anatomy and Histology

Taking an Honours degree provides the opportunity for students to undertake a full-time research project supervised by a member of academic staff. A list of the current projects offered can be found on the Anatomy and Histology website. Assessment is based on a thesis summarising the results of the year's research, along with a final seminar and participation in weekly meetings with peers.

To be eligible for Honours, the student needs to obtain an appropriate standard in Senior Anatomy, Histology or Neuroscience units, and have a SciWAM of 65. As departmental permission is required to be admitted to the Honours program, all candidates must meet with the Honours coordinator before the end of semester two of the preceding year (semester one for mid-year applicants) to discuss your intentions to undertake honours in Anatomy and Histology. Following these discussions you may lodge a formal application with the Faculty of Science.

Honours Coordinator:
Dr Paul Austin
T +61 2 9351 5061
E paul.austin@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Anatomy and Histology Honours			
ANAT4011 **Anatomy Honours A**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
ANAT4012 **Anatomy Honours B**	12	**C** ANAT4011	Semester 1 Semester 2
ANAT4013 **Anatomy Honours C**	12	**C** ANAT4012	Semester 1 Semester 2
ANAT4014 **Anatomy Honours D**	12	**C** ANAT4013	Semester 1 Semester 2

Science Honours

Applied Medical Science

Major global health issues provide the basis for enquiry and skills development in big data, clinical sciences, diagnostics and treatment and prevention of human disease.

Applied Medical Sciences covers the specialised knowledge and skills required by people who wish to apply medical and health sciences knowledge and skills to the prevention, diagnosis and treatment of human disease in a technical or research setting.

Honours allow students to acquire the fundamental skills in:

- literature searching
- study design
- critical thinking
- problem solving
- data interpretation
- communicating scientific knowledge.

It offers an interdisciplinary and integrated approach to medical sciences education, bringing together elements from multiple disciplines including:

- molecular and cellular biology
- clinical and diagnostic sciences
- pathology
- population health
- pharmacology
- ethics
- law; and
- economics.

Student learning will occur in the real world in one of the most exciting and complex medical research and hospital environments including the new translational research hub at Westmead Campus. The Westmead Campus offers students access to the facilities, technologies, scientific and support services necessary to learn a broad range of skills and undertake high quality medical sciences and health research.

Applying for Admission to Honours

Honours is a one-year course by research normally taken at the end of your third year. The Applied Medical Science Honours Program includes two 6cp coursework units that will focus on the development of research skills, and 36cp of research project.

The Applied Medical Science Honours Program offers a number of areas of study for the degree of Bachelor of Science (Honours) or Bachelor of Medical Science (Honours). To be eligible students should have completed a major in one of the following areas:

- Applied Medical Science
- Anatomy and Histology
- Biochemistry
- Bioinformatics
- Biology
- Cell Pathology
- Immunobiology
- Medicinal Chemistry
- Microbiology
- Molecular Biology and Genetics
- Neuroscience
- Pharmacology
- Physiology.

Honours Coordinator:

Andrew Harman
T +61 2 8627 3623
E andrew.harman@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Applied Medical Science Honours			
AMED4101 **Research Skills and Processes**	6	**A** A major in one of the following areas: Applied Medical Science, Immunology & Pathology; Biochemistry & Molecular Biology; Biology; Microbiology; Cell & Developmental Biology, Infectious Diseases, Pharmacology; Medicinal Chemistry; Neuroscience, Physiology, Anatomy and Histology, Genetics & Genomics; Quantitative Life Science *Note: Department permission required for enrolment*	Semester 1 Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
AMED4102 Scientific Analysis and Communication	6	**A** A major in one of the following areas: Applied Medical Science, Immunology & Pathology; Biochemistry & Molecular Biology; Biology; Microbiology; Cell & Developmental Biology, Infectious Diseases, Pharmacology; Medicinal Chemistry; Neuroscience, Physiology, Anatomy and Histology, Genetics & Genomics; Quantitative Life Science **P** AMED4101	Semester 2
AMED4103 Research Project A	6	**A** A major in one of the following areas: Applied Medical Science, Immunology & Pathology; Biochemistry & Molecular Biology; Biology; Microbiology; Cell & Developmental Biology, Infectious Diseases, Pharmacology; Medicinal Chemistry; Neuroscience, Physiology, Anatomy and Histology, Genetics & Genomics; Quantitative Life Science **C** AMED4101	Semester 1 Semester 2
AMED4104 Research Project B	6	**A** A major in one of the following areas: Applied Medical Science, Immunology & Pathology; Biochemistry & Molecular Biology; Biology; Microbiology; Cell & Developmental Biology, Infectious Diseases, Pharmacology; Medicinal Chemistry; Neuroscience, Physiology, Anatomy and Histology, Genetics & Genomics; Quantitative Life Science **C** AMED4103	Semester 1 Semester 2
AMED4105 Research Project C	6	**A** A major in one of the following areas: Applied Medical Science, Immunology & Pathology; Biochemistry & Molecular Biology; Biology; Microbiology; Cell & Developmental Biology, Infectious Diseases, Pharmacology; Medicinal Chemistry; Neuroscience, Physiology, Anatomy and Histology, Genetics & Genomics; Quantitative Life Science **C** AMED4104	Semester 1 Semester 2
AMED4106 Research Project D	6	**A** A major in one of the following areas: Applied Medical Science, Immunology & Pathology; Biochemistry & Molecular Biology; Biology; Microbiology; Cell & Developmental Biology, Infectious Diseases, Pharmacology; Medicinal Chemistry; Neuroscience, Physiology, Anatomy and Histology, Genetics & Genomics; Quantitative Life Science **C** AMED4102	Semester 1 Semester 2
AMED4107 Research Project E	6	**A** A major in one of the following areas: Applied Medical Science, Immunology & Pathology; Biochemistry & Molecular Biology; Biology; Microbiology; Cell & Developmental Biology, Infectious Diseases, Pharmacology; Medicinal Chemistry; Neuroscience, Physiology, Anatomy and Histology, Genetics & Genomics; Quantitative Life Science **C** AMED4106	Semester 1 Semester 2
AMED4108 Research Project F	6	**A** A major in one of the following areas: Applied Medical Science, Immunology & Pathology; Biochemistry & Molecular Biology; Biology; Microbiology; Cell & Developmental Biology, Infectious Diseases, Pharmacology; Medicinal Chemistry; Neuroscience, Physiology, Anatomy and Histology, Genetics & Genomics; Quantitative Life Science **C** AMED4107	Semester 1 Semester 2

Science Honours

Biochemistry

In order to study Biochemistry in an Honours year, eligible students can enrol in the Biochemistry Honours Program at the School of Life and Environmental Sciences.

During honours, students will be involved in a study program designed for those wishing to further develop their laboratory skills and critical thinking. The program is strongly recommended for any student wishing to enter a research career or undertake further work leading to a higher degree. It provides the opportunity for individual laboratory research work under the direction of a supervisor. This project culminates in the production of a research thesis and presentation of the key findings in a seminar. During the year each student is also expected to attend research seminars and complete a coursework component that consists of tutorials and an exam based on the critical evaluation of scientific manuscripts. Assessment is based on the research project (including laboratory performance, written report and oral presentation) and the coursework (tutorial performance and written exam).

Honours research areas

Biochemistry Honours is conducted within the School of Life and Environmental Sciences. The school offers projects in a wide range of research areas including:

- structural biology
- proteomics and biotechnology
- nutrition and metabolism
- molecular biology and genetics, and
- microbiology.

School of Life and Environmental Sciences Honours Guide which can be obtained from the school office or online here: http://sydney.edu.au/science/life-environment/downloads/A5_SOLES_HonsUoS.pdf.

For further information on specific research projects prospective students should consult the Honours projects page and contact the individual academic staff members here: http://sydney.edu.au/science/life-environment/study/honours/projects.shtml.

Applying for admission to Honours

The Honours program offers entry at the beginning of the academic year (Semester One, commencing in February) and a limited number of places for mid-year entry (Semester Two, commencing in August).

Please refer to the school website for application details, dates and schedules. Students should arrange to speak with potential supervisors and are able to nominate up to 10 supervisors in order of preference on the School of Life and Environmental Sciences online Honours application form.

Attempts will be made where possible to assign students to the supervisor of their choice. In such cases the school will work with students to find an available project.

Students should note that some supervisors cannot accommodate mid-year entrants. The usual requirement for acceptance into the Honours program is a credit average in a major relevant to the project of interest; any student with an undergraduate background relevant to specific projects (including chemistry, biochemistry, nutrition and dietetics, microbiology, immunobiology, physiology, neuroscience, mathematics, physics, biology or other related medical sciences) may be admitted.

It should be noted that the number of students accepted into the Honours program may be limited because of resource restrictions (availability of a supervisor and/or laboratory space) and that, in the event of there being more applicants than resources will allow, offers will be made on the basis of academic merit.

Honours Coordinator, Associate Professor Andrew Holmes
T +61 2 9351 2530
E andrew.holmes@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Biochemistry Honours			
BCHM4011 Biochemistry Honours A	12	*School permission is required for enrolment. Entry into the School Honours program normally requires a credit average in a major relevant to the chosen project or relevant 24 cp of senior study. The School will consider entry by students who do not have this requirement if their overall academic performance indicates an equivalent performance in other subject areas or if their SCIWAM exceeds 65.*	Semester 1 Semester 2
BCHM4012 Biochemistry Honours B	12	**C** BCHM4011 *School permission is required for enrolment. Entry into the School Honours program normally requires a credit average in a major relevant to the chosen project or relevant 24 cp of senior study. The School will consider entry to students who do not have this requirement if their overall academic performance indicates an equivalent performance in other subject areas or if their SCIWAM exceeds 65.*	Semester 1 Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
BCHM4013 **Biochemistry Honours C**	12	**C** BCHM4012 *School permission is required for enrolment. Entry into the School Honours program normally requires a credit average in a major relevant to the chosen project or relevant 24 cp of senior study. The School will consider entry by students who do not have this requirement if their overall academic performance indicates an equivalent performance in other subject areas or if their SCIWAM exceeds 65.*	Semester 1 Semester 2
BCHM4014 **Biochemistry Honours D**	12	**C** BCHM4013 *School permission is required for enrolment. Entry into the School Honours program normally requires a credit average in a major relevant to the chosen project or relevant 24 cp of senior study. The School will consider entry by students who do not have this requirement if their overall academic performance indicates an equivalent performance in other subject areas or if their SCIWAM exceeds 65.*	Semester 1 Semester 2

Science Honours

Biology

A single Honours program in Biology accommodates students who have completed 24 credit points of Senior Biology units and have a minimum WAM of 65. Details of available projects are contained in the School of Life and Environmental Sciences Honours Guide which can be obtained from the school office or online here:http://sydney.edu.au/science/life-environment/downloads/A5_SOLES_HonsUoS.pdf

During the Honours year the principles established in the first three years of the undergraduate award course are further developed, and students are introduced to a wider field of Biology and biological techniques. Students may elect to specialise in any of the aspects of Biology that are studied in the school. Projects jointly supervised by staff in other schools or departments within the University may also be considered.

For further information on specific research projects prospective students should consult the Honours projects page and contact the individual academic staff members here:
http://sydney.edu.au/science/life-environment/study/honours/projects.shtml

The Honours year comprises:

1. a project in which the student investigates a problem and presents oral and written accounts of their research.
2. a coursework unit BIOL4015 Scientific Research in Biology, instruction in experimental design, and other technical training.

The degree will be awarded on the basis of: (a) written assignments from coursework units; (b) marks awarded for a thesis on the subject of the project.

Honours Coordinator, Professor Ashley Ward
E ashley.ward@sydney.edu.au
T +61 2 9351 4778

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Biology Honours			
BIOL4015 **Scientific Research in Biology**	6	**C** BIOL4016 **N** BIOL4009 or BIOL4010 or BIOL4011 or BINF5002 or BINF5003 *BIOL4016 corequisite not required by Bioinformatics Masters Research Stream students.*	Semester 1 Semester 2
BIOL4016 **Biology Honours A**	6	**C** BIOL4015 **N** BIOL4011	Semester 1 Semester 2
BIOL4012 **Biology Honours B**	12	**C** BIOL4015 and BIOL4016	Semester 1 Semester 2
BIOL4013 **Biology Honours C**	12	**C** BIOL4012	Semester 1 Semester 2
BIOL4014 **Biology Honours D**	12	**C** BIOL4013	Semester 1 Semester 2

Science Honours

Cell Pathology

The Discipline of Pathology offers a number of areas of study for the degree of Bachelor of Science (Honours) or Bachelor of Medical Science (Honours). Honours is a one-year course by research normally taken at the end of your third year. It is not necessary to have undertaken the two Cell Pathology Units in the Discipline of Pathology to undertake an Honours year in Pathology. During the year, students are encouraged to broaden their knowledge by attending seminars in other disciplines and in other institutions, or even by participating in national conferences.

Honours Coordinator:
Associate Professor Brett Hambly
T +61 2 9351 3059
E brett.hambly@sydney.edu.au

Honours Administrator:
T +61 2 9351 2414
F +61 2 8627 1606
E pathology.admin@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Cell Pathology Honours			
CPAT4011 **Cell Pathology Honours A**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
CPAT4012 **Cell Pathology Honours B**	12	**C** CPAT4011	Semester 1 Semester 2
CPAT4013 **Cell Pathology Honours C**	12	**C** CPAT4012	Semester 1 Semester 2
CPAT4014 **Cell Pathology Honours D**	12	**C** CPAT4013	Semester 1 Semester 2

Science Honours

Chemistry

The Chemistry Honours program gives students the opportunity to get involved in a research program in an area that is of interest to them. It provides training in research techniques and experience using modern research instrumentation. The Honours program adds a new dimension to the skills that the students have acquired during their undergraduate years and enhances their immediate employment prospects and, more significantly, their future career potential. All students with a sound record in chemistry are encouraged to apply for entry to the Honours program.

Further information is available on the school's website.

The Honours program

The School of Chemistry offers a wide range of possible projects in all areas of contemporary chemistry including computational and theoretical chemistry, chemical education, molecular design and synthesis, materials chemistry, green chemistry and renewable energy, molecular spectroscopy and photonics, drug discovery and medicinal chemistry, supramolecular chemistry, biological chemistry/chemical biology, soft matter and neutron and synchrotron diffraction and spectroscopy. Details of available projects are contained in the school's Honours booklet that is available from the school's information desk and on the school's website.

Workload and assessment

In the Honours year, each student undertakes a research project under the supervision of a member of staff, attends a series of lectures aimed at developing generic skills, and attends research seminars. At the culmination of the research year, the student presents a seminar and a thesis which explains the problem, outlines the research undertaken and the results obtained.

Honours Coordinator:
Dr Girish Lakhwani
T +61 2 9351 5783
E girish.lakhwani@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Chemistry Honours			
CHEM4011 **Chemistry Honours A**	12		Semester 1 Semester 2
CHEM4012 **Chemistry Honours B**	12	**C** CHEM4011	Semester 1 Semester 2
CHEM4013 **Chemistry Honours C**	12	**C** CHEM4012	Semester 1 Semester 2
CHEM4014 **Chemistry Honours D**	12	**C** CHEM4013	Semester 1 Semester 2

Science Honours

Computer Science

To be awarded Honours in Computer Science, students need to complete 48 credit points of units of study, with 18 credit points in the project, 6 credit points of IT research methods plus 24 credit points from the Honours table.

Note that the faculty requires that Honours be completed in two consecutive semesters of full-time study, or four consecutive semesters of part-time study; a single final grade and mark is given for the Honours course, as determined by the faculty based on performance in Honours and in prior undergraduate study.

Honours Coordinator:
Dr Josiah Poon
T +61 2 9351 7185
E josiah.poon@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Computer Science Honours			
Students must complete 24 credit points from the following core units of study, including INFO4999:			
INFO5993 **IT Research Methods**	6		Semester 1 Semester 2
INFO4991 **IT Research Thesis A**	6	**P** Enrolment in BIT Honours **C** INFO5993 *INFO4991 and INFO4992 together form the Honours Research thesis. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed.*	Semester 1 Semester 2
INFO4992 **IT Research Thesis B**	12	**P** Enrolment in BIT Honours **C** INFO4991 and INFO5993 *INFO4991 and INFO4992 together form the Honours Research thesis. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed.*	Semester 1 Semester 2
INFO4999 **Computer Science Honours Result**		**P** Permission of the Head of Department	Semester 1 Semester 2
Students must complete 24 credit points from the following elective units of study:			
COMP5045 **Computational Geometry**	6	**A** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees.	Semester 1
COMP5046 **Natural Language Processing**	6	**A** Knowledge of an OO programming language *Note: Department permission required for enrolment*	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5048 **Visual Analytics**	6	**A** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills.	Semester 2
COMP5318 **Machine Learning and Data Mining**	6	**A** INFO2110 OR ISYS2110 OR COMP9120 OR COMP5138	Semester 1
COMP5338 **Advanced Data Models**	6	**A** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/COMP9120 (Database Management Systems) or INFO2120/INFO2820/ISYS2120 (Database Systems 1).	Semester 2
COMP5347 **Web Application Development**	6	**A** COMP9220 or COMP5028. The course assumes basic knowledge on OO design and proficiency in a programming language	Semester 1
COMP5348 **Enterprise Scale Software Architecture**	6	**A** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.	Semester 1
COMP5415 **Multimedia Design and Authoring**	6		Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** ELEC3506 OR ELEC9506 OR ELEC5740 OR COMP5116	Semester 2
COMP5424 **Information Technology in Biomedicine**	6		Semester 1
COMP5425 **Multimedia Retrieval**	6	**A** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge.	Semester 1
COMP5426 **Parallel and Distributed Computing**	6		Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3305, ELEC3506, ELEC3607 and ELEC5508 **P** ELEC5509	Semester 2
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths.	Semester 2
INFO5010 **IT Advanced Topic A**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO5991 **Services Science Management and Engineering**	6	**A** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business.	Semester 1 Semester 2
INFO5992 **Understanding IT Innovations**	6	**A** INFO5990 **N** PMGT5875	Semester 1 Semester 2
INFO6012 **Information Technology Strategy and Value**	6	**A** COMP5206 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.	Semester 1

Science Honours

Geography

Entry into fourth year Honours will require completion of a major in Geography or Environmental Studies and a satisfactory WAM. For students in degree programs administered by the Faculty of Science, this is defined as a minimum SciWAM of 65. For students in other degree programs, this is defined as a Credit average. In some years, when the number of applicants exceeds the availability of resources (e.g. availability of supervisors, laboratory space), offers of admission will be made according to academic merit. Students will be notified in January of their formal acceptance into the Honours program.

Honours Coordinator:
Professor Phil McManus
T +61 2 9351 4242
E phil.mcmanus@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Geography Honours			
GEOG4011 **Geography Honours A**	12		Semester 1 Semester 2
GEOG4012 **Geography Honours B**	12	**C** GEOG4011	Semester 1 Semester 2
GEOG4013 **Geography Honours C**	12	**C** GEOG4012	Semester 1 Semester 2
GEOG4014 **Geography Honours D**	12	**C** GEOG4013	Semester 1 Semester 2

Science Honours

Geology and Geophysics

Both Semester One (February) and Semester Two (July) commencement is offered. Information sessions about Geology and Geophysics Honours are held for interested third year students during Second Semester. Students contemplating Honours in their fourth year should consider possible thesis topics and discuss these with potential staff supervisors.

Entry into fourth year Honours will require completion of a major in Geology and Geophysics and a satisfactory WAM. For students in degree programs administered by the Faculty of Science, this is defined as a minimum SciWAM of 65. For students in other degree programs, this is defined as a Credit average. In some years, when the number of applicants exceeds the availability of resources (e.g. availability of supervisors, laboratory space), offers will be made according to academic merit. Students will be notified in January of their formal acceptance into the Honours program.

Honours students are required to undertake formal coursework during their first semester and to participate in seminars throughout the year as arranged. They will be required to study original problems, working as appropriate in the field, the laboratory, libraries, and in some instances in conjunction with other university or government departments. A thesis of not more than 20,000 words needs to be submitted at the conclusion of the Honours program.

Honours Coordinator:
Professor Phil McManus
T +61 2 9351 4242
E phil.mcmanus@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Geology Honours			
GEOL4011 **Geology Honours A**	12		Semester 1 Semester 2
GEOL4012 **Geology Honours B**	12	**C** GEOL4011	Semester 1 Semester 2
GEOL4013 **Geology Honours C**	12	**C** GEOL4012	Semester 1 Semester 2
GEOL4014 **Geology Honours D**	12	**C** GEOL4013	Semester 1 Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Geophysics Honours			
GEOP4011 **Geophysics Honours A**	12		Semester 1 Semester 2
GEOP4012 **Geophysics Honours B**	12	**C** GEOP4011	Semester 1 Semester 2
GEOP4013 **Geophysics Honours C**	12	**C** GEOP4012	Semester 1 Semester 2
GEOP4014 **Geophysics Honours D**	12	**C** GEOP4013	Semester 1 Semester 2

Science Honours

History and Philosophy of Science

An Honours course in History and Philosophy of Science (HPS) is available to students of sufficient merit who have satisfied the requirements for the degree of Bachelor of Science, Bachelor of Arts or Bachelor of Liberal Arts and Science with a major in HPS or another relevant area.

Students who have obtained the TSP Certificate in HPS are also eligible for the Honours program.

The Honours course consists of 48 points of Honours level units of study, which needs to include:

- HPSC4201 HPS Research Project 1
- HPSC4202 HPS Research Project 2
- HPSC4203 HPS Research Project 3 and
- HPSC4204 HPS Research Project 4
- In their final semester all students also need to enrol in the zero credit point non-assessable unit HPSC4999.

Applying for admission to Honours

Students intending to proceed to Honours or to enrol in the Graduate Diploma in Science (HPS) are strongly advised to contact the department towards the end of the previous academic year to discuss their thesis topic and supervision.

Note: Honours level (4000) Units of Study are available only to students admitted to HPS Honours, Graduate Diploma in Science (History and Philosophy of Science) and Graduate Certificate in Science (History and Philosophy of Science), or by special permission.

A number of our Honours-level courses are also open to students in the medical humanities and liberal studies.

Honours Coordinator:
Dr Professor Peter Godfrey-Smith
T +61 2 9351 7782
E peter.godfrey-smith@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
History and Philosophy of Science Honours			
All students must enrol in HPSC4999. Honours students must complete 48 credit points from the following units of study:			
HPSC4101 **Philosophy of Science**	6		Semester 1
HPSC4102 **History of Science**	6		Semester 2
HPSC4103 **Sociology of Science**	6		Semester 2
HPSC4104 **Recent Topics in HPS**	6		Semester 1 Semester 2
HPSC4105 **HPS Research Methods**	6		Semester 1
HPSC4108 **Core topics: History and Philosophy of Sci**	6		Semester 1 Semester 2
HPSC4201 **HPS Research Project 1**	6	**A** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **N** HPSC4106 or HPSC4107	Semester 1 Semester 2
HPSC4202 **HPS Research Project 2**	6	**A** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **N** HPSC4106 or HPSC4107	Semester 1 Semester 2
HPSC4203 **HPS Research Project 3**	6	**A** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **C** HPSC4202 **N** HPSC4106 or HPSC4107	Semester 1 Semester 2
HPSC4204 **HPS Research Project 4**	6	**A** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **N** HPSC4106 or HPSC4107	Semester 1 Semester 2
HPSC4999 **History and Philosophy of Science Honours**			Semester 1 Semester 2

Science Honours

Immunology

The Honours program in Immunology provides the opportunity for full-time research on a proposed project supervised by a staff member expert in that field. Experimental research, a seminar and a thesis constitute the major part of the program and of assessment. Guidance in research techniques is given in training programs covering experimental design, data analysis, written and oral communication and critical appraisal of the literature. Student contributions to this program are also assessed. In addition, a supplementary seminar program keeps students informed and abreast of wider issues in immunology.

Applying for Honours

Students are invited to apply for Honours enrolment during semester two of the year preceding Honours. Applicants should consult the Honours coordinator in the first instance. A list of possible research topics is provided, and students select projects of interest, speak with prospective supervisors and apply for permission to enrol, before the end of semester two. Within the constraints of availability, an attempt is made to assign students to the project of their choice.

General Requirements for Admission

Usually Honours candidates will have achieved a Credit in senior immunology units of study and will also have successfully completed Senior study in biochemistry, biology, cell pathology, microbiology, physiology or virology. Bachelor of Science candidates will have gained a major in Immunobiology, or a related discipline such as biochemistry, biology, cell pathology, microbiology or physiology. Usually Honours candidates will have an overall SCIWAM of 68 or greater. Departmental permission is required for enrolment.

Honours Coordinator:
Dr Carl Feng
T +61 2 9351 6177
E carl.feng@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Immunology Honours			
IMMU4011 **Immunology Honours A**	12	**N** BMED4011 *Note: Department permission required for enrolment*	Semester 1 Semester 2
IMMU4012 **Immunology Honours B**	12	**C** IMMU4011 **N** BMED4012	Semester 1 Semester 2
IMMU4013 **Immunology Honours C**	12	**C** IMMU4012 **N** BMED4013	Semester 1 Semester 2
IMMU4014 **Immunology Honours D**	12	**C** IMMU4013 **N** BMED4014	Semester 1 Semester 2

Science Honours

Infectious Diseases

This Honours area is only available to students in the Bachelor of Medical Science (BMedSc).

The Honours program in Infectious Diseases provides the opportunity for full-time research on a proposed project supervised by a staff member expert in that field. Experimental research, a seminar and a thesis constitute the major part of the program and of assessment. Guidance in research techniques is given in training programs covering experimental design, data analysis, written and oral communication and critical appraisal of the literature. Student contributions to this program are also assessed. In addition, a supplementary seminar program keeps students informed and abreast of wider issues in infectious diseases.

Applying for admission to Infectious Diseases Honours

Students are invited to apply for Honours enrolment during semester two of the year preceding Honours. Applicants should consult the Honours coordinator in the first instance. A list of possible research topics is provided, and students select projects of interest, speak with prospective supervisors and apply for permission to enrol, before the end of semester two. Within the constraints of availability, an attempt is made to assign students to the project of their choice.

Usually Honours candidates will have achieved a Credit in the senior unit Infectious Diseases and will also have successfully completed Senior study in biochemistry, microbiology, or virology. Usually Honours candidates will have an overall SCIWAM of 68 or greater. Departmental permission is required for enrolment.

Honours Coordinator:
Dr Carl Feng
T +61 2 9351 6177
E carl.feng@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Infectious Diseases Honours			
This is only available for students in the Bachelor of Medical Science (BMedSc).			
INFD4011 **Infectious Diseases Honours A**	12	**N** BMED4021 *Note: Department permission required for enrolment*	Semester 1
INFD4012 **Infectious Diseases Honours B**	12	**C** INFD4011 **N** BMED4022	Semester 1
INFD4013 **Infectious Diseases Honours C**	12	**C** INFD4012 **N** BMED4023	Semester 2
INFD4014 **Infectious Diseases Honours D**	12	**C** INFD4013 **N** BMED4024	Semester 2

Science Honours

Information Systems

To be awarded Honours in Information Systems, students need to complete 48 credit points of units of study, with 18 credit points in the project, 6 credit points of IT Research Methods plus 24 credit points from the Honours table.

Note that the faculty requires that Honours be completed in two consecutive semesters of full-time study, or four consecutive semesters of part-time study; a single final grade and mark is given for the Honours course, as determined by the faculty based on performance in Honours and in prior undergraduate study.

Honours Coordinator:
Dr Josiah Poon
T +61 2 9351 7185
E josiah.poon@sydney.edu.au

Unit of study	***Credit points***	***A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition***	***Session***
Information Systems Honours			
Students must complete 24 credit points from the following core units of study, including INFO4999:			
INFO5993 **IT Research Methods**	6		Semester 1 Semester 2
INFO4991 **IT Research Thesis A**	6	**P** Enrolment in BIT Honours **C** INFO5993 *INFO4991 and INFO4992 together form the Honours Research thesis. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed.*	Semester 1 Semester 2
INFO4992 **IT Research Thesis B**	12	**P** Enrolment in BIT Honours **C** INFO4991 and INFO5993 *INFO4991 and INFO4992 together form the Honours Research thesis. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed.*	Semester 1 Semester 2
INFO4999 **Computer Science Honours Result**		**P** Permission of the Head of Department	Semester 1 Semester 2
Students must complete 24 credit points from the following elective units of study:			
COMP5045 **Computational Geometry**	6	**A** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees.	Semester 1
COMP5046 **Natural Language Processing**	6	**A** Knowledge of an OO programming language *Note: Department permission required for enrolment*	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5048 **Visual Analytics**	6	**A** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills.	Semester 2
COMP5318 **Machine Learning and Data Mining**	6	**A** INFO2110 OR ISYS2110 OR COMP9120 OR COMP5138	Semester 1
COMP5338 **Advanced Data Models**	6	**A** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/COMP9120 (Database Management Systems) or INFO2120/INFO2820/ISYS2120 (Database Systems 1).	Semester 2
COMP5347 **Web Application Development**	6	**A** COMP9220 or COMP5028. The course assumes basic knowledge on OO design and proficiency in a programming language	Semester 1
COMP5348 **Enterprise Scale Software Architecture**	6	**A** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.	Semester 1
COMP5415 **Multimedia Design and Authoring**	6		Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** ELEC3506 OR ELEC9506 OR ELEC5740 OR COMP5116	Semester 2
COMP5424 **Information Technology in Biomedicine**	6		Semester 1
COMP5425 **Multimedia Retrieval**	6	**A** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge.	Semester 1
COMP5426 **Parallel and Distributed Computing**	6		Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3305, ELEC3506, ELEC3607 and ELEC5508 **P** ELEC5509	Semester 2
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths.	Semester 2
INFO5010 **IT Advanced Topic A**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO5991 **Services Science Management and Engineering**	6	**A** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business.	Semester 1 Semester 2
INFO5992 **Understanding IT Innovations**	6	**A** INFO5990 **N** PMGT5875	Semester 1 Semester 2
INFO6012 **Information Technology Strategy and Value**	6	**A** COMP5206 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.	Semester 1

Science Honours

Mathematics and Statistics

In general, 4 units of study (24 credit points) are required in order to major in Mathematics and a credit average is required to progress to an Honours year. Potential Honours students are strongly encouraged to include one or more Advanced level unit(s) of study and seek advice from a Senior year coordinator.

Particular combinations would be suitable for students with special interests.

Honours Administrator:
Ms Rebecca O'Brien
T +61 2 9351 5807
E rebecca.obrien@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Mathematics (Applied) Honours			
MATH4401 **Applied Mathematics Honours A**	12		Semester 1 Semester 2
MATH4402 **Applied Mathematics Honours B**	12	**C** MATH4401	Semester 1 Semester 2
MATH4403 **Applied Mathematics Honours C**	12	**C** MATH4402	Semester 1 Semester 2
MATH4404 **Applied Mathematics Honours D**	12	**C** MATH4403	Semester 1 Semester 2
Mathematics (Pure) Honours			
MATH4301 **Pure Mathematics Honours A**	12		Semester 1 Semester 2
MATH4302 **Pure Mathematics Honours B**	12	**C** MATH4301	Semester 1 Semester 2
MATH4303 **Pure Mathematics Honours C**	12	**C** MATH4302	Semester 1 Semester 2
MATH4304 **Pure Mathematics Honours D**	12	**C** MATH4303	Semester 1 Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Statistics Honours			
STAT4201 **Mathematical Statistics Honours A**	12		Semester 1 Semester 2
STAT4202 **Mathematical Statistics Honours B**	12	**C** STAT4201	Semester 1 Semester 2
STAT4203 **Mathematical Statistics Honours C**	12	**C** STAT4202	Semester 1 Semester 2
STAT4204 **Mathematical Statistics Honours D**	12	**C** STAT4203	Semester 1 Semester 2

Science Honours

Microbiology

During the Honours year, students will be involved in a study program designed for those wishing to further develop their laboratory skills and critical thinking. The program is very strongly recommended for any student wishing to enter a research career or undertake further work leading to a higher degree. The program provides the opportunity for individual laboratory research work under the direction of a supervisor. This project culminates in the production of a research thesis and presentation of the key findings in a seminar. During the year each student is also expected to attend research seminars and complete a coursework component that consists of tutorials and an exam based on the critical evaluation of scientific manuscripts. Assessment is based on the research project (including laboratory performance, written report and oral presentation) and the coursework (tutorial performance and written exam).

Honours research areas

Microbiology Honours is conducted within the School of Life and Environmental Sciences. The School offers Microbiology Honours projects in a wide range of research areas including molecular and medical microbiology, microbial genetics, applied and environmental microbiology, biotechnology, and virology. Details of available projects are contained in the School of Life and Environmental Sciences Honours Guide which can be obtained from the school office or online here:http://sydney.edu.au/science/life-environment/downloads/A5_SOLES_HonsUoS.pdf.

For further information on specific research projects prospective students should consult the Honours projects page and contact the individual academic staff members here: http://sydney.edu.au/science/life-environment/study/honours/projects.shtml.

Applying for admission to Honours

The Honours program offers entry at the beginning of the academic year (Semester One, commencing in February) and a limited number of places for mid-year entry (Semester Two, commencing in August). Students need to speak with potential supervisors and are able to nominate up to 10 supervisors in order of preference on the School of Life and Environmental Sciences online Honours application form. Attempts will be made where possible to assign students to the supervisor of their choice but this will not always be possible. In such cases the School will work with students to find an available project. Students should note that some supervisors cannot accommodate mid-year entrants. The usual requirement for acceptance into the Honours program is a credit average in a major relevant to the project of interest; any student with an undergraduate background relevant to specific projects (including chemistry, biochemistry, nutrition and dietetics, microbiology, immunobiology, physiology, neuroscience, mathematics, physics, biology or other related medical sciences) may be admitted. It should be noted that the number of students accepted into the Honours program may be limited because of resource restrictions (availability of a supervisor and/or laboratory space) and that, in the event of there being more applicants than resources will allow, offers will be made on the basis of academic merit.

Honours Coordinator, Associate Professor Andrew Holmes
E andrew.holmes@sydney.edu.au
T +61 2 9351 2530

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Microbiology Honours			
MICR4011 **Microbiology Honours A**	12	*School permission is required for enrolment. Entry into the School Honours program normally requires a credit average in a major relevant to the chosen project or relevant 24 credit points of senior study. The School will consider entry by students who do not have this requirement if their overall academic performance indicates an equivalent performance in other subject areas or if their SCIWAM exceeds 65.*	Semester 1 Semester 2
MICR4012 **Microbiology Honours B**	12	**C** MICR4011 *School permission is required for enrolment. Entry into the School Honours program normally requires a credit average in a major relevant to the chosen project or relevant 24 credit points of senior study. The School will consider entry to students who do not have this requirement if their overall academic performance indicates an equivalent performance in other subject areas or if their SCIWAM exceeds 65.*	Semester 1 Semester 2
MICR4013 **Microbiology Honours C**	12	**C** MICR4012 *School permission is required for enrolment. Entry into the School Honours program normally requires a credit average in a major relevant to the chosen project or relevant 24 credit points of senior study. The School will consider entry to students who do not have this requirement if their overall academic performance indicates an equivalent performance in other subject areas or if their SCIWAM exceeds 65.*	Semester 1 Semester 2
MICR4014 **Microbiology Honours D**	12	**C** MICR4013 *School permission is required for enrolment. Entry into the School Honours program normally requires a credit average in a major relevant to the chosen project or relevant 24 credit points of senior study. The School will consider entry to students who do not have this requirement if their overall academic performance indicates an equivalent performance in other subject areas or if their SCIWAM exceeds 65.*	Semester 1 Semester 2

Science Honours

Neuroscience

There are many opportunities for high-achieving students to undertake honours study within the field of Neuroscience. Honours projects in Neuroscience can be undertaken within individual disciplines: Anatomy, Pathology, Pharmacology, Physiology, and Psychology, as well as within our associated research centres. Students should canvass their respective Disciplines during their senior studies for details of research projects, admission criteria and enrolment details.

Science Honours

Physics

Qualifying

To be considered for admission to the Honours program, students need 24 credit points of senior Physics units of study or equivalent with a SciWAM as specified in the degree resolutions.

Classes

24 credits of lecture classes (minimum of 16 credits in physics).

Assessment

Coursework examinations, a 40-page research report and oral presentation of the Research project. Physics Honours comprises formal coursework (weighted 50 percent) and a research project (weighted 50 percent).

Undertaking an Honours year in Physics

The Honours program in Physics provides students with an opportunity to undertake an original research project as well as attend advanced lecture courses to give students a broad understanding of modern physics at a high level. All students satisfying the qualifying requirements as set out in this handbook are strongly encouraged to apply for entry into Physics Honours. Full-time enrolment is equivalent to 48 credit points for the year. Students are offered an opportunity to carry out independent research as a member of one of the active research groups in the School of Physics, under the supervision of a member of staff. Some research projects involve collaboration with staff from complementary disciplines. Honours students join a research group in the School of Physics and are encouraged to participate with staff and research students in activities within the school. They are provided with office accommodation, and are expected to attend colloquia and seminars. They may be employed for several hours per week in Junior teaching. Further information is available from Physics Student Services, the Honours Coordinator or from the School of Physics website.

Honours Coordinator:
A/Prof. Bruce Yabsley
T +61 2 9351 6808
E physics.honours@sydney.edu.au

Ask a question:
E physics.studentservices@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Physics Honours			
PHYS4011 **Physics Honours A**	12		Semester 1 Semester 2
PHYS4012 **Physics Honours B**	12	**C** PHYS4011	Semester 1 Semester 2
PHYS4013 **Physics Honours C**	12	**C** PHYS4012	Semester 1 Semester 2
PHYS4014 **Physics Honours D**	12	**C** PHYS4013	Semester 1 Semester 2

Science Honours

Physiology

After completing the requirements for award of a Bachelor of Medical Science or Bachelor of Science a student who has **majored** in Physiology may be permitted to undertake a fourth honours year. This consists mainly of a research project carried out under the supervision of a member of the academic staff. A list of projects offered for the coming session will be provided on the Physiology website. Early in the course the student is required to write an extended essay based on the subject of their research, and will throughout the year attend timetabled honours sessions. Examination is mainly by thesis, with the student's performance in the laboratory and in the end-of-year public seminar being considered.

Opportunities exist to gain teaching experience by casual employment as a demonstrator in undergraduate practical classes. To qualify for entry into these honours courses you need to meet the minimum requirements of the Faculty of Science and the discipline.

All students need to apply to the discipline to be admitted to an honours year. Gaining entry into honours in Physiology is competitive - the standard you need to achieve must meet certain minimum requirements, but will also depend on the number and quality of other applicants in that year. **Candidates are required to meet with the Honours coordinator before the end of semester two of the preceding year (Semester One for mid year applicants), to discuss your intentions and lodge a completed expression of interest form prior to lodging an application form with the Faculty of Science.** An expression of interest form can be downloaded from the Discipline website. A copy of a completed and signed expression of interest form is the only documentation you should submit as proof of contact with the Discipline. **Only those applicants who have attached a completed expression of interest and have met with the Honours coordinator before lodging their application will be approved.**

Honours Coordinator:
Associate Professor Stephen Assinder
T +61 2 9036 3614
E stephen.assinder@sydney.edu.au

Honours Administrator:
Ms Louise Harrison
T +61 2 9351 3478
E louise.harrison@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Physiology Honours			
PHSI4011 Physiology Honours A	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
PHSI4012 Physiology Honours B	12	**C** PHSI4011	Semester 1 Semester 2
PHSI4013 Physiology Honours C	12	**C** PHSI4012	Semester 1 Semester 2
PHSI4014 Physiology Honours D	12	**C** PHSI4013	Semester 1 Semester 2

Science Honours

Psychology

Completing fourth year Psychology Honours offers graduates a provisional registration with the Psychology Board of Australia and enables them to apply for further postgraduate study leading to full registration as a professional psychologist in Australia. The Honours program adds a new dimension to the skills that the students have acquired during their undergraduate years and enhances their immediate employment prospects and, more significantly, their future career potential. Besides the most obvious route to a career in professional psychologies, there are many other career opportunities such as in the Police service, marketing, coaching and organisational development, public relations and policy in the government sector, science journalism and many more.

Prerequisites for admission

Entry is competitive on the basis of academic merit. In order to be eligible to enter Psychology Honours, a completed APAC accredited major in Psychology is required with a minimum credit average or better across both the Intermediate and Senior Psychology units of study. This major must include 48 credit points (or equivalent) of Intermediate and Senior Psychology units of study, and must include senior statistical methods unit PSYC3010 (or equivalent from external institutions). The credit average is a minimum requirement and it may not be sufficient to gain entry into the Honours program as the strength of the applicants varies each year.

Additional Criteria:
###128::162### If you are a University of Sydney Faculty of Science student, a SCIWAM of at least 65
###128::162### If you wish to be considered for the Theoretical Thesis option, successful completion of a third-year level History and Philosophy of Psychology unit

Due to restricted resources for research supervision, the intake to Psychology Honours is limited to approximately 80 students and will be determined by academic merit in Intermediate and Senior Psychology units of study.

Course Details

Psychology Honours program is 1 year full-time study (part-time candidature may be permitted under special circumstances only), consisting of:

Empirical Thesis (50% of final Honours mark) – throughout Semester 1 and 2; and

Coursework:
Semester 1:
a) 2 x Special Fields elective modules (each worth 15%) OR Theoretical Thesis (30%)
b) Psychological Research Methods (15%)

Semester 2
c) Ethics and Professional Issues (5%)

Further information is available on the School of Psychology website.

Assessment

In summary, students are required to:

1. devise, conduct and report upon an Empirical Thesis research project
2. attend two Special Fields seminars and complete required assessment tasks or write a Theoretical Thesis; and
3. attend all lectures for Ethics and Professional Issues in Psychology and Research Methods and complete the required assessment tasks

Empirical Thesis: Semester 1: devise, conduct and submit a report on your empirical research project in a research area (this is dependent on the interests and specialisation of the academic staff member supervising your thesis). In S2 write up and submit final Empirical Thesis.

Special Field modules: Semester 1: written assessment/presentation in each of the modules
OR
Theoretical thesis: Semester 1: draft and submit final Theoretical Thesis

Ethics and Professional Issues in Psychology: Semester 1: exam

Research Methods: Semester 2: exam

Honours Coordinator:
Dr Evan Livesey
T +61 2 9351 2845
E evan.livesey@sydney.edu.au

Honours Support Team (administrative matters):
E psychology.honours@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Psychology Honours			
PSYC4011 **Psychology Honours A**	12		Semester 1 Semester 2
PSYC4012 **Psychology Honours B**	12	**C** PSYC4011	Semester 1 Semester 2
PSYC4013 **Psychology Honours C**	12	**C** PSYC4012	Semester 1 Semester 2
PSYC4014 **Psychology Honours D**	12	**C** PSYC4013	Semester 1 Semester 2

Veterinary Biology (Honours)

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
VETS4042 **Veterinary Research A**	24	**P** Veterinary Science Years 1, 2 3 and 4 **C** VETS4043 *Note: Department permission required for enrolment*	Semester 1
VETS4043 **Veterinary Research B**	24	**P** VETS4042 *Note: Department permission required for enrolment*	Semester 2

Unit of study descriptions

VETS4042
Veterinary Research A

Credit points: 24 **Teacher/Coordinator:** Dr Roslyn Bathgate **Session:** Semester 1 **Classes:** No lectures or classes. **Prerequisites:** Veterinary Science Years 1, 2 3 and 4 **Corequisites:** VETS4043 **Assessment:** Thesis, executive summary, oral presentation and oral examination. **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

In this unit students undertake a period of supervised research in a topic in Veterinary Science.

VETS4043
Veterinary Research B

Credit points: 24 **Teacher/Coordinator:** Dr Roslyn Bathgate **Session:** Semester 2 **Classes:** No lectures or classes. **Prerequisites:** VETS4042 **Assessment:** Thesis, executive summary, oral presentation and oral examination. **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

This unit of study is a continuation of VETS4042.

Science Honours

Soil Science

The Honours program consists of:

1. 24 credit points worth course work, the unit of studies to be selected in consultation with the supervisor;
2. Research project in Agricultural Chemistry or Soil Science disciplines, worth 24 credit points. The research project includes five marked assessments: research proposal, literature review, poster, research paper and an oral presentation.

Honours Coordinator:
Professor Balwant Singh
T +61 2 8627 1140
E balwant.singh@sydney.edu.au

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Soil Science Honours			
SOIL4021 **Soil Science Honours A**	12		Semester 1 Semester 2
SOIL4022 **Soil Science Honours B**	12	**C** SOIL4021	Semester 1 Semester 2
SOIL4023 **Soil Science Honours C**	12	**C** SOIL4022	Semester 1 Semester 2
SOIL4024 **Soil Science Honours D**	12	**C** SOIL4023	Semester 1 Semester 2

Bachelor of Animal and Veterinary Bioscience

The Bachelor of Animal and Veterinary Bioscience students will be based at the Camperdown Campus for the first three years of the course and will use the faculty's large animal teaching and research facilities at the University farms and Camden Campus.

Professional development

Throughout the degree and in university vacations, students will undertake a professional development program incorporating at least 60 days of practical, faculty-supported work experience.

Bachelor of Animal and Veterinary Bioscience

Bachelor of Animal and Veterinary Bioscience (Honours)

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BUANVEBI-01	Bachelor of Animal and Veterinary Bioscience

2 Attendance pattern

The attendance pattern for this course is full time or part time according to candidate choice.

3 Admission to candidature

Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents), tertiary study or an approved preparation program. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for mature aged applicants who do not possess a school leaving qualification, educationally disadvantaged applicants and for Aboriginal and Torres Strait Islander people. Applicants are ranked by merit and offers for available places are issued according to the ranking. Details of admission policies are found in the Coursework Rule.

4 Requirements for award

(1) The units of study that may be taken for the course are set out in the Table of units of study for the Bachelor of Animal and Veterinary Bioscience.
(2) To qualify for the award of the pass degree, a candidate must successfully complete 192 credit points, comprising:
(a) 48 credit points of first year core units of study; and
(b) 48 credit points of second year core units of study; and
(c) 48 credit points of third year units of study, including:
(i) A minimum of 24 credit points of core units of study which may be completed in either Year 3 or Year 4, as prescribed in the Table of units of study; or
(ii) 30 credit points chosen from the Table for Animal and Veterinary Bioscience units of study for a major.
(iii) A maximum of 24 credit points of elective units of study; and
(d) 48 credit points of fourth year units of study as prescribed in the table of units of study.

5 Majors

(1) Completion of a major is not a requirement of the course.
(2) Candidates have the option of completing one major.
(3) Core units of study that are common to the requirements of a major may count to that major, however, any unit of study may only count towards one major.
(4) Where a unit of study is common to more than one major, the student must nominate, by the end of their final year, the particular major to which the unit is to be allocated.
(5) The available majors are:
(a) Animal Genetics and Biotechnology
(b) Animal Health and Disease
(c) Animal Production Systems
(d) Wildlife Conservation and Management

6 Progression rules

(1) Candidates for the degree may enrol in the units of study prescribed for the fourth year of candidature only after completion of Year 1 to Year 3.
(2) All candidates are required to undertake a minimum of 60 days of professional experience as a part of their overall training in this degree.

7 Requirements for the Honours degree

(1) Honours is available to meritorious candidates who complete an alternative set of units of study in Year 4 of the course. Admission to the honours program is by permission of the program coordinator after the completion of Year 3.
(2) Admission requires:
(a) Candidates to normally be of no more than three years standing, and normally have no fail or absent fail results; and
(b) a WAM of at least 65 in Year 2 and three (3) units of study.
(3) To qualify for the award of the honours degree, a candidate must:
(a) complete the requirements for the pass degree but include the alternative honours pathway described in the table of units for the degree; and
(b) obtain a minimum WAM of 65 in Year 2 and Year 3 units of study and a minimum WAM of 65 in Year 4 units of study
(c) normally be of no more than four years standing in the degree
(d) normally have no fail or absent fail results.
(4) The grade of honours will be determined by the final honours mark. The final honours mark is the average of the Year 2, Year 3 and Year 4 WAM.
(5) In exceptional circumstances the conditions for the award of honours may be varied at the Dean's discretion.

8 Award of the degree

(1) The Bachelor of Animal and Veterinary Bioscience is awarded in the grades of either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Second Class according to the rules specified in the following table:

Description	Minimum Year 2 and Year 3	Minimum Year 4	Final Honours grade
Honours Class I	70	75	Grade >= 75
Honours Class II (Division 1)	65	70	70 <= Grade < 75
Honours Class II (Division 2)	65	65	65 <= Grade < 70

Description	Minimum Year 2 and Year 3	Minimum Year 4	Final Honours grade
Honours not awarded	Grade < 65		

(2) Candidates for the award of the Honours degree who do not meet the requirements, but who have otherwise satisfied the course requirements, will be awarded the pass degree.

9 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2015 and students who commenced their candidature prior to 1 January, 2015 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2015 may complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that the requirements are completed by 1 January, 2018. The Faculty may specify a later date for completion or specify alternative requirements for completion of candidatures that extend beyond this time.

Bachelor of Animal and Veterinary Bioscience

Unit of study table

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Year 1			
Year 1 has the following 48 credit point structure:			
AVBS1002 **Concepts of Animal Management**	6	**A** AGEN1004 or BIOL1XXX or AVBS1003 **N** AGEN2006	Semester 2
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
or			
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
or			
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
or			
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
or			
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
or			
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
or			
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
or			
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
CHEM1012 **Fundamentals of Chemistry 1B**	6	**P** CHEM1XX1 **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992	Semester 2
or			
CHEM1112 **Chemistry 1B**	6	**P** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992	Semester 1 Semester 2
or			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1912 **Chemistry 1B (Advanced)**	6	**P** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 *Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.*	Semester 2
or			
CHEM1992 **Chemistry 1B (Special Studies Program)**	6	**P** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 *Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.*	Semester 2
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
ENVI1003 **Global Challenges: Food, Water, Climate**	6		Semester 2
AVBS1003 **Animals and Us**	6	**N** VETS1018	Semester 1
Year 2			
Year 2 has the following 48 credit point structure:			
AGEC1006 **Economic Environment of Agriculture**	6	**A** HSC Mathematics **N** AGEC1003 or AGEC1004	Semester 2
BIOL2032 **Australian Wildlife Biology**	6	**N** ANSC2005	Semester 2
ENVX2001 **Applied Statistical Methods**	6	**P** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
or			
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
Students who commenced BAVBS in 2017 are advised to take GEGE2X01 in semester 1			
ANSC3103 **Animal Structure and Function A**	6	**A** AVBS1002 **P** 12cp from (BIOL1XXX, VETS1032, AGEN2001)	Semester 1
ANSC3104 **Animal Structure and Function B**	6	**P** ANSC3103	Semester 2
AVBS2001 **Introductory Veterinary Pathogenesis**	6	**A** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **P** 6cp of BIOL1XXX or MBLG1XX1	Semester 2
VETS1032 **Animal Energetics and Homeostasis**	6	**A** HSC level chemistry and/or biology would be an advantage	Semester 1
Year 3 Year 3 has the following 48 credit point structure:			
Core All students complete:			
AVBS3000 **Professional Development**	6		Semester 1 Semester 2
The core 24 credit points for each major are listed in the relevant table. Core units may be taken in either Year 3 or Year 4 depending on prerequisite requirements.			
One major may be taken in:			
* Animal Genetics and Biotechnology (see list of required core units of study in Table 1)			
* Animal Health and Disease (see list of required core units of study in Table 2)			
* Animal Production Systems (see list of required core units of study in Table 3)			
* Wildlife Conservation (see list of required core units of study in Table 4)			
Elective units			
Enrolment in elective units is subject to prerequisite and corequisite requirements, prohibitions and timetabling constraints. Special permission may be required to enrol in some units.			
AGCH3025 **Chemistry and Biochemistry of Foods**	6	**A** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **N** AFNR5102 or AGCH3017 or AGCH3024	Semester 1
AGCH3033 **Environmental Chemistry** *This unit of study is not available in 2018*	6	**A** SOIL2003 and LWSC2002 **P** 12 cp Junior Chemistry (CHEM1001 or CHEM1101 or CHEM1901) and (CHEM1002 or CHEM1102 or CHEM1902 or AGEN1006) **N** CHEM2404	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ANSC3105 **Animal Biotechnology**	6		Semester 2
ANSC3107 **Animal Genetics 3**	6	**P** GENE2001 or GENE2002 or GEGE2X01 or MBLG2X72	Semester 2
AREC3001 **Production Modelling and Management**	6	**P** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901	Semester 2
AREC3002 **Agricultural Markets**	6	**P** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901	Semester 2
AVBS3001 **Agents of Disease**	6	**A** Animal and Veterinary Bioscience years 1-2 **P** AVBS2001	Semester 1
AVBS3002 **Laboratory Disease Investigation**	6	**A** CHEM1XXX and BIOL1XXX and ANSC3103 and ANSC3104 and (ENVX2001 or BIOM2001) **P** 12cp from (MICR2X31 or IMMU2101 or AVBS2001 or AVBS3001)	Semester 2
AVBS3003 **Wildlife Management**	6	**A** All core Units of Study in Year 1 and 2 of BAnVetBioSc degree **P** 24 credit points from second year core units of study	Semester 1
BIOL3007 **Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3907	Semester 2
BIOL3010 **Tropical Wildlife Biology** *This unit of study is not available in 2018*	6	**P** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **N** BIOL3910 or BIOL2010 or BIOL2910 *Note: Department permission required for enrolment* *This unit runs in February. It cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2017, 2019) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive February
BIOL3013 **Marine Biology**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3913	Semester 2
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1
BIOL2033 **Entomology**	6	**N** ENTO2001	Semester 2
ENVX3002 **Statistics in the Natural Sciences**	6	**P** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 *Interdisciplinary Unit*	Semester 1
Year 4			
Coursework			
Enrolment in elective units is subject to prerequisite and corequisite requirements, prohibitions and timetabling constraints.			
AGRO4005 **Livestock Production Systems**	6	**A** Junior plant and animal biology (or equivalent), junior chemistry biology, intermediate crop and animal production, nutrition and physiology (or equivalent). **P** 6cp from BIOL1XXX	Semester 2
AGRO4006 **New and Emerging Tech in Animal Science**	6	**P** 6cp from BIOL1XXX	Semester 1
AGEN5001 **Agricultural and Environmental Extension**	6		Semester 1
ANSC3106 **Animal Behaviour and Welfare Science 3**	6	**P** AVBS1002	Semester 2
AVBS4001 **Animal Health and Disease**	6	**P** AVBS2001 and AVBS3001	Semester 1
AVBS4002 **Dairy Production and Technology**	6	**A** Enrolled students are expected to have some understanding of key components of the dairy production system, including basic knowledge of animal physiology and nutrition.	Semester 2
AVBS4003 **Wildlife and Evolutionary Genetics**	6		Semester 2
AVBS4004 **Food Safety Assessment and Management**	6	**P** AVBS3001 and AVBS4001	Semester 2
AVBS4005 **Feed Technology**	6	**P** ANSC3101	Semester 1
AVBS4008 **Intensive Animal Industries**	6	**P** (Animal and Veterinary Bioscience years 1-3) OR (Bachelor of Science in Agriculture years 1-3)	Semester 2
AVBS4009 **Aquaculture**	6	**P** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3	Semester 1
AVBS4012 **Extensive Animal Industries**	6	**P** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3	Semester 1
AVBS4019 **Equine Science and Industry**	6		Semester 2
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1
BIOM4003 **Matrix Algebra and Linear Models**	6	**P** ENVX3002	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
GENE4015 **Cytogenetics**	6	**P** (BIOM2001 or ENVX2001) and (GENE2001 or GENE2002)	Intensive July
Honours			
Students in the Honours program enrol in 24 credit points of year 4 coursework units (including any major units), and the following four units of study:			
AVBS4015 **Research Project A1**	6	**P** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **C** AVBS4016 and AVBS4017 and AVBS4018 **N** AVBS4013 or AVBS4014	Semester 1 Semester 2
AVBS4016 **Research Project A2**	6	**P** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **C** AVBS4015 and AVBS4017 and AVBS4018 **N** AVBS4013 or AVBS4014	Semester 1 Semester 2
AVBS4017 **Research Project A3**	6	**P** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **C** AVBS4015 and AVBS4016 and AVBS4018 **N** AVBS4013 or AVBS4014	Semester 1 Semester 2
AVBS4018 **Research Project A4**	6	**P** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **C** AVBS4015 and AVBS4016 and AVBS4017 **N** AVBS4013 or AVBS4014	Semester 1 Semester 2

Bachelor of Animal and Veterinary Bioscience Majors

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Core			
All students undertake the following:			
AVBS3000 **Professional Development**	6		Semester 1 Semester 2
Students must complete the relevent core units of study from the associated major list below. Additional Years 3 and 4 electives may be selected from the Elective List.			
Table 1: Animal Genetics and Biotechnology major			
Comprises 24 credit points, of which ANSC3105 and ANSC3107 are compulsory.			
ANSC3105 **Animal Biotechnology**	6		Semester 2
ANSC3107 **Animal Genetics 3**	6	**P** GENE2001 or GENE2002 or GEGE2X01 or MBLG2X72	Semester 2
and at least two of the following:			
AVBS4003 **Wildlife and Evolutionary Genetics**	6		Semester 2
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1
GENE4015 **Cytogenetics**	6	**P** (BIOM2001 or ENVX2001) and (GENE2001 or GENE2002)	Intensive July
Table 2: Animal Health and Disease Major			
Comprises 24 credit points:			
AVBS3001 **Agents of Disease**	6	**A** Animal and Veterinary Bioscience years 1-2 **P** AVBS2001	Semester 1
AVBS3002 **Laboratory Disease Investigation**	6	**A** CHEM1XXX and BIOL1XXX and ANSC3103 and ANSC3104 and (ENVX2001 or BIOM2001) **P** 12cp from (MICR2X31 or IMMU2101 or AVBS2001 or AVBS3001)	Semester 2
AVBS4001 **Animal Health and Disease**	6	**P** AVBS2001 and AVBS3001	Semester 1
AVBS4004 **Food Safety Assessment and Management**	6	**P** AVBS3001 and AVBS4001	Semester 2
Table 3: Animal Production Systems Major			
Comprises 30 credit points:			
ANSC3101 **Animal Nutrition 3**	6	**A** Fundamentals of Biochemistry **P** AVBS2001 and [VETS1032 or AGEN2001 or (MICR2X31 or MICR2024)] **C** AVBS2001 and MICR2X31	Semester 2
ANSC3102 **Animal Reproduction**	6	**A** ANSC3104	Semester 1
ANSC3105 **Animal Biotechnology**	6		Semester 2
ANSC3106 **Animal Behaviour and Welfare Science 3**	6	**P** AVBS1002	Semester 2
ANSC3107 **Animal Genetics 3**	6	**P** GENE2001 or GENE2002 or GEGE2X01 or MBLG2X72	Semester 2
Table 4: Wildlife Conservation and Management Major			
Comprises 24 credit points, of which AVBS3003 and BIOL3007 are compulsory.			
AVBS3003 **Wildlife Management**	6	**A** All core Units of Study in Year 1 and 2 of BAnVetBioSc degree **P** 24 credit points from second year core units of study	Semester 1
BIOL3007 **Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3907	Semester 2
and at least two of the following:			
ANSC3101 **Animal Nutrition 3**	6	**A** Fundamentals of Biochemistry **P** AVBS2001 and [VETS1032 or AGEN2001 or (MICR2X31 or MICR2024)] **C** AVBS2001 and MICR2X31	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ANSC3102 **Animal Reproduction**	6	**A** ANSC3104	Semester 1
ANSC3106 **Animal Behaviour and Welfare Science 3**	6	**P** AVBS1002	Semester 2
ANSC3107 **Animal Genetics 3**	6	**P** GENE2001 or GENE2002 or GEGE2X01 or MBLG2X72	Semester 2
AVBS3001 **Agents of Disease**	6	**A** Animal and Veterinary Bioscience years 1-2 **P** AVBS2001	Semester 1
AVBS4003 **Wildlife and Evolutionary Genetics**	6		Semester 2

Bachelor of Animal and Veterinary Bioscience

Unit of study descriptions

Year 1

Year 1 has the following 48 credit point structure:

AVBS1002
Concepts of Animal Management

Credit points: 6 **Teacher/Coordinator:** Dr Cameron Clark **Session:** Semester 2 **Classes:** On average 6 hours per week (lectures and practicals) **Prohibitions:** AGEN2006 **Assumed knowledge:** AGEN1004 or BIOL1XXX or AVBS1003 **Assessment:** Participation, written assignments, quizzes and end of semester examination **Practical field work:** There will be several whole day practical classes at the Camden campus **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the management of animals in natural and man-made environments. At the end of this unit of study, students will understand: the characteristics of the management systems of the major domestic species used for production in Australia and in a world wide context; the characteristics and principles underpinning sustainable management of native animals in natural and man-made environments; an appreciation of the dependence of living organisms upon their environment; an appreciation of indigenous land management and the husbandry practices and innovations that have been adopted by the production industries to retain their competitive advantage; a demonstrated capability in handling and husbandry of the major domestic production animal species, and an appreciation of the application of these skills to non-domestic species; a demonstrated understanding of the importance of high standards of animal welfare practice in the management of animals.

Textbooks
There is no single text that adequately covers the unit content and for this reason no formal text is required. Where appropriate, relevant reference material will be identified for specific areas of the course.

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

or

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

or

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks

Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

or

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

or

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1012
Fundamentals of Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1XX1 **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Fundamentals of Chemistry 1B is built on a satisfactory prior knowledge of

Fundamentals of Chemistry 1A. Compared to the mainstream Chemistry 1B, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1112
Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2 **Classes:** 1x3-hr lecture; 1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviours, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do we develop lotions that don't burn us, how do we measure UV absorption by sunscreens, how can we measure and alter soil pH, how are sticky things made, and how do we determine the concentration of vitamin C in juice? Through enquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B is built on a satisfactory prior knowledge of Chemistry 1A.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1912
Chemistry 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B (Advanced) is built on a satisfactory prior knowledge of Chemistry 1A (Advanced). Compared to the mainstream Chemistry 1B, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1992
Chemistry 1B (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 12 weeks **Prerequisites:** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 **Assessment:** quizzes, assignment, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how food and medicines work, the properties of materials and substances. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as a demonstrated aptitude. Chemistry 1B (Special Studies Program) is restricted to students who have gained a Distinction in Chemistry 1A (Special Studies Program) or by invitation. The practical work syllabus for Chemistry 1B (Special Studies Program) is very different from that for Chemistry 1B and Chemistry 1B (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1B (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

ENVX1002
Introduction to Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Thomas Bishop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour tutorial per week, one 2-hour computer practical per week **Prohibitions:** ENVX1001 **Assessment:** One exam during the exam period (50%), three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This is an introductory statistics unit for students in the agricultural, life and environmental sciences. It provides the foundation for statistics and data science skills that are needed for a career in science and for further study in applied statistics and data science. In the first portion of the unit the emphasis is on describing data using statistical and graphical summaries, and probability models. In the second part the focus is on formal hypothesis testing on experimental data using statistical tests. The final part of the unit is on finding patterns in biological and environmental data, through the use of linear and non-linear functions. In the practicals the emphasis is on applying theory to analysing real datasets using the spreadsheet package Excel and the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

ENVI1003
Global Challenges: Food, Water, Climate

Credit points: 6 **Teacher/Coordinator:** A/Prof Stephen Cattle **Session:** Semester 2 **Classes:** Two lectures per week, 2hour tutorial/computer lab per week, two-day weekend field trip **Assessment:** One 2-hour exam (50%), field trip report (15%), tutorial presentation (20%), GIS reports (15%) **Practical field work:** Computer practicals and two day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

In the 21st century the population of the world will increase both in size and its expectation in terms of food, energy and consumer demands. Against this demand we have a planet in crisis where natural resources are degraded, biodiversity is diminishing and planetary cycles related to climate are reaching points of irreversible change. Management of our precious natural resources is a balancing act between production and conservation as always, but now we have to do this against a background of potential large scale changes in climate. In this unit students will gain an understanding of the key environmental challenges of the 21st century; namely food security, climate change, water security, biodiversity protection, ecosystems services and soil security. In the second half using Australian case studies we will explore how we manage different agro-ecosystems within their physical constraints around water, climate and soil, while considering linkages with the global environmental challenges. Management now, in the past and the future will be considered, with an emphasis on food production. This unit is recommended unit for students interested in gaining a broad overview of the environmental challenges of the 21st century, both globally and within Australia.

AVBS1003
Animals and Us

Credit points: 6 **Teacher/Coordinator:** Prof Claire Wade **Session:** Semester 1 **Classes:** Two lectures; one 3-hour practical; one peer assisted study session per week **Prohibitions:** VETS1018 **Assessment:** Assignments, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

We live in a world surrounded by and dependent on animals. Australia has one of the highest rates of animal ownership in the world: dogs, cats, rabbits, birds and reptiles being common. In this unit, you explore animals in society (including companion, pocket and pet, wildlife and zoo animals). You will investigate relationships between humans and animals and normal function of animals including development, disease, aging and death. This unit will describe how human and animal health are related, outline legislation and policies on the care and use of animals, cover topical issues in animal welfare and ethics, provide opportunities for students to observe animal behaviours and discuss how cultural backgrounds influence our relationships with animals. You will visit captive and clinical animal facilities where animals are displayed for conservation, curiosity, aesthetics and research. Practicals and workshops will provide students with skills in critical thinking, communication, information/digital literacy and an evidence informed basis on which to make decisions. This unit is for students who are interested in a professional career working with animals, such as those in the AVBS stream and BVB/DVM program or who generally seek an understanding of how animals enrich our lives.

Textbooks

Animals and Us Unit of Study Guide and Practical Manual TBD

Year 2

Year 2 has the following 48 credit point structure:

AGEC1006
Economic Environment of Agriculture

Credit points: 6 **Session:** Semester 2 **Classes:** 2x1hr lectures/week, 1x1hr tutorial/week **Prohibitions:** AGEC1003 or AGEC1004 **Assumed knowledge:** HSC Mathematics **Assessment:** 1x2hr exam (55%) and 1x50 min mid-semester exam (25%) and workshop papers (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to give an understanding of some basic economic principles and to introduce the characteristics of the economic environment in which Australian agriculture operates. Topics to be covered include the structure, nature and history of the agricultural industries in Australia; agricultural adjustment in the world economy; introductory principles of production economics and farm management; elementary price theory and the factors affecting the demand, supply and prices of agricultural commodities.

Textbooks

HE Drummond and JW Goodwin, Agricultural Economics, 3rd edn (Prentice-Hall, 2011)

BIOL2032
Australian Wildlife Biology

Credit points: 6 **Teacher/Coordinator:** Dr Catherine Herbert **Session:** Semester 2 **Classes:** Three lectures; one 2-hour tutorial or practical session each week **Prohibitions:** ANSC2005 **Assessment:** Quizzes, presentation assignment, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Australia is home to a broad diversity of vertebrate wildlife species, many of which are unique to the Australian environment, having evolved in isolation from other large land-masses for millions of years. This unit examines the diversity of Australian reptiles, amphibians, birds and mammals (including all three mammalian lineages; monotremes, marsupials and eutherian mammals). We focus on the unique anatomical, physiological and behavioural adaptations that have enabled our wildlife to survive and thrive within varied Australian ecosystems. We also examine how the uniqueness of our wildlife is also one of its greatest challenges, being naÂ¿ve to the new threats that are present in our rapidly changing environments. At the end of this unit you should have an appreciation of the diversity and uniqueness of Australian wildlife; be able to determine the links between form and function in wildlife and understand the significance of these functional adaptations in relation to ecological challenges. You will also have an understanding of the interactions between humans and wildlife, and how the unique characteristics of our wildlife also make them vulnerable to threats within the rapidly changing Australian environment. Students will also develop enhanced scientific literacy and communication skills through tutorial activities and assessment tasks.

Textbooks

No text book requirements. Recommended reading throughout semester provided by each lecture relevant to their class content. Relevant scientific papers will be uploaded to LMS

ENVX2001
Applied Statistical Methods

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 3-hour computer practical per week **Prerequisites:** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] **Assessment:** One exam during the exam period (50%),three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This unit builds on introductory 1st year statistics units and is targeted towards students in the agricultural, life and environmental sciences. It consists of two parts and presents, in an applied manner, the statistical methods that students need to know for further study and their future careers. In the first part the focus is on designed studies including both surveys and formal experimental designs. Students will learn how to analyse and interpret datasets collected from designs from more than than 2 treatment levels, multiple factors and different blocking designs. In the second part the focus is on finding patterns in data. In this part the students will learn to model relationships between response and predictor variables using regression, and find patterns in datasets with many variables using principal components analysis and clustering. This part provides the foundation for the analysis of big data. In the practicals the emphasis is on applying theory to analysing real datasets using the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

GEGE2001
Genetics and Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prohibitions:** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution.

or

GEGE2901
Genetics and Genomics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution. The Advanced mode of Genetics and Genomics will provide you with challenge and a higher level of academic rigour. You will have the opportunity to plan and carry out a project that will develop your skills in contemporary genetics/molecular biology techniques and will provide you with a greater depth of disciplinary understanding. The Advanced mode will culminate in a written report and in an oral presentation where you will discuss a recent breakthrough that has been enabled by the use of modern genetics and genomics technologies. This is a unit for anyone wanting to better understand the how genetics has shaped the earth and how it will shape the future.

Textbooks

TBA

Students who commenced BAVBS in 2017 are advised to take GEGE2X01 in semester 1

ANSC3103
Animal Structure and Function A

Credit points: 6 **Teacher/Coordinator:** Dr Peter White **Session:** Semester 1 **Classes:** Lectures 3 hours per week, laboratories/tutorials 2 hours per week (note these will vary depending upon the week) **Prerequisites:** 12cp from (BIOL1XXX, VETS1032, AGEN2001) **Assumed knowledge:** AVBS1002 **Assessment:** Assignments/online quiz and examinations **Practical field work:** This unit involves dissection of animal cadavers **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Structure and Function A will develop an understanding of the role of the body systems in maintaining homeostasis in an animal's internal environment. In ASFA the structure and function of the musculoskeletal, cardiovascular, respiratory, urinary and integumentary systems of the body are explored in depth particularly with reference to the maintenance of homeostasis. The developed understanding of the normal functioning of these systems allows identification of the impact on the animal of abnormal function of these systems. A study of the structure and function of muscle will include its role in movement and as meat in a production setting. The overall goals of the Unit are (i) to enable students to develop a rich understanding of the relationships between body systems and structures (to be continued in ASFB). (ii) to develop generic skills particularly in group work and oral presentation,(iii) to develop an appreciation of the links between structure and function and their relevance to animal disease and production that will be further developed in Veterinary Pathogenesis as well as in advanced, applied studies in Behaviour in third year and in 4th year Animal Production.

Textbooks

For the animal structure component of the unit: Dyce, KM, Sack, WO and Wensing, CJG 2002, Textbook of veterinary anatomy, 3rd edn, W.B.Saunders, Philadelphia
For the physiology component of this unit: Sherwood, L, Klandorf, H and Yancey, P H (2005) Animal Physiology: From Genes to Organisms, Thomson Brooks Cole, Belmont CA

ANSC3104
Animal Structure and Function B

Credit points: 6 **Teacher/Coordinator:** Dr Hamutal Mazrier **Session:** Semester 2 **Classes:** lectures 3 hours per week, laboratories/tutorials 2 hours per week, group work and/or independent learning activities 1 hour per week. Activities will vary on a weekly basis. **Prerequisites:** ANSC3103 **Assessment:** Anatomy dissection project (25%), critical review (25%), mid-semester and final examinations (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this Unit students will complete the study of the structure and function of organ systems in animals started in ANSC3103. The role of the immune system will be investigated in relation to maintenance of internal homeostasis. An introduction to the nervous system and male and female reproductive anatomy and physiology will form the basis for further applied studies in these areas in third year Units of Study in Animal Health and Disease and Animal Reproduction. There will be development of the generic skills of critically reading and writing.

Textbooks

For Animal Structure: Dyce, KM, Sack, WO and Wensing, CJG 2010, Textbook of Veterinary Anatomy, 4th edn, W.B.Saunders, Philadelphia
For Animal Function: for each topic, students will be directed to a recommended reading list available from the University of Sydney Library

The details of lecture outlines, objectives, reference lists, details of practical classes, staffing as well as other relevant class material will be available for students via the e-learning site.

AVBS2001
Introductory Veterinary Pathogenesis

Credit points: 6 **Teacher/Coordinator:** A/Prof Damien Higgins **Session:** Semester 2 **Classes:** 6 hours per week (lectures and practicals) **Prerequisites:** 6cp of BIOL1XXX or MBLG1XX1 **Assumed knowledge:** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **Assessment:** Practical class exercises (15%), mid-semester exam (20%), practical exam (15%), written exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The overarching theme for this unit of study is the concept of the interaction between the host (or the animal), the agent of disease (genetics, physical, chemical and infectious agents) and environmental factors. In disease states, the host responds to the aetiological agent of disease and the environment through one of the basic five pathological processes that occur in tissues. These include inflammation and repair, degeneration and necrosis, circulatory disturbances, tissue deposits and pigments, and disorders of growth. A case based approach will be used whenever possible to illustrate these principles and enable the student to develop a problem solving approach and the skills of critical thinking.

Textbooks

McGavin, MD and Zachary JF 2007, Pathologic Basis of Disease 4th ed., Mosby
Playfair JHL and Chain BM 2009, Immunology at a Glance. 9th ed. Wiley-Blackwell, ISBN 978-1-4051-8052-8
Tizard, Ian R 2009, Veterinary Immunology: an introduction. 8th ed. Saunders Elsevier St Louis, Mosby

VETS1032
Animal Energetics and Homeostasis

Credit points: 6 **Teacher/Coordinator:** A/Prof Paul Sheehy **Session:** Semester 1 **Classes:** 39 hours of lectures per semester, 7 hours of practicals per semester, 4 hours of tutorials per semester **Assumed knowledge:** HSC level chemistry and/or biology would be an advantage **Assessment:** Intra-semester: one exam (25%) end of semester; one 2-hour written exam (60%) other: one cytology group learning exercise (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will further develop student's understanding of animal cells and how they interact in whole animals and how energy from food is used to facilitate cellular function. Further investigation of cellular structure that facilitates this function will form as an introduction to the focus of the unit which is to develop understanding of metabolism in cells and whole animals. An introduction to the contribution of the endocrine system to homeostasis of animals via their effects on animal metabolism and physiology will also be described. An understanding of commonly occurring disturbances to the production or action of hormones will be developed with clinical material being used to illustrate normal structure and function. The ultimate objective of this unit is to enable students to utilise biochemical, observational and animal pathology to propose the underlying basis of metabolic or other non-infectious disease and consider opportunities for intervention to restore homeostasis.

Textbooks

VETS1032 Animal Energetics and Homeostasis of Study outline and practical class manual

Year 3

Year 3 has the following 48 credit point structure:

Core

All students complete:

AVBS3000
Professional Development

Credit points: 6 **Teacher/Coordinator:** Dr Sabrina Lomax **Session:** Semester 1, Semester 2 **Classes:** Six preparatory workshops/seminars (throughout years 1-3), four 1-hour industry seminars for case studies (year 3) **Assessment:** Professional experience reports (65%), case studies (20%), essay on current animal issues (15%) **Practical field work:** 60 days of professional work experience to be completed by the commencement of fourth year **Mode of delivery:** Professional practice

Students are required to undertake professional development in University vacations as an integral and essential part of their overall training in the degree of Bachelor of Animal and Veterinary Bioscience. Students will complete 60 days of professional work experience throughout their program by the commencement of fourth year, including a minimum of 20 days spent on commercial animal production enterprises. Students will visit at least two different farming enterprises in the major and emerging animal production industries. The remaining 40 days will include at least one placement with an animal-related business or service provider, and experience in either a scientific research organisation or short scientific volunteer position. Students will undertake additional placements at relevant animal or animal-related businesses, farms or organisations as required to complete 60 days. A professional consultant-style report must be submitted after each placement. Seminars to promote awareness of career options and current issues in animal science will be provided on a regular basis by past graduates and other professionals working in the animal industries. Students are encouraged to attend as many of these as possible throughout their degree program, and are required to submit four case studies based on material presented in these seminars. Attendance at seminars is compulsory during third year. Students will also submit an essay on a current issue in the animal science area of their choice.

Textbooks

On-line resource material will be available

The core 24 credit points for each major are listed in the relevant table. Core units may be taken in either Year 3 or Year 4 depending on prerequisite requirements. One major may be taken in:* Animal Genetics and Biotechnology (see list of required core units of study in Table 1)* Animal Health and Disease (see list of required core units of study in Table 2)* Animal Production Systems (see list of required core units of study in Table 3)* Wildlife Conservation (see list of required core units of study in Table 4)

Elective units

Enrolment in elective units is subject to prerequisite and corequisite requirements, prohibitions and timetabling constraints. Special permission may be required to enrol in some units.

AGCH3025
Chemistry and Biochemistry of Foods

Credit points: 6 **Teacher/Coordinator:** Dr Thomas Roberts (Coordinator), Prof Les Copeland **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 4-hour practical fortnightly **Prohibitions:** AFNR5102 or AGCH3017 or AGCH3024 **Assumed knowledge:** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **Assessment:** One 2-hour exam (40%) and six lab reports (6x10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to give students an understanding of the properties of food constituents, and the interactions between these constituents during food processing, storage and digestion. The unit will develop an understanding of the relationship between form and functionality of constituents and the concept of fitness-for-purpose (i.e., quality) in converting agricultural products into foods. Students will gain an appreciation of the relationship between chemical composition and properties of macroconstituents (carbohydrates, proteins, lipids) and microconstituents (vitamins, minerals, antioxidants, flavour and anti-nutritional chemicals) and their functions in plant- and animal-based foods. The material presented in lectures and practical classes will enable students to develop research and inquiry skills and an analytical approach in understanding the biochemistry of foods, food processing and storage. On completing this unit, students will be able to describe the chemical and biochemical properties of major food constituents, and demonstrate an understanding of the functionality of these constituents in food processing and nutrition. Students will have gained experience in laboratory techniques used in industry for the analysis of some food products, and information literacy and communication skills from the preparation of practical reports.

Textbooks

Lecture and laboratory notes will be made available through Blackboard. There is no recommended textbook.

AGCH3033
Environmental Chemistry

Credit points: 6 **Teacher/Coordinator:** Dr. Feike Dijkstra (Coordinator); Prof. Balwant Singh; A/Prof. Michael Kertesz **Session:** Semester 2 **Classes:** 2 lec & 3hr prac/wk **Prerequisites:** 12 cp Junior Chemistry (CHEM1001 or CHEM1101 or CHEM1901) and (CHEM1002 or CHEM1102 or CHEM1902 or AGEN1006) **Prohibitions:** CHEM2404 **Assumed knowledge:** SOIL2003 and LWSC2002 **Assessment:** Research Proposal (35%), Prac Reports (50%), Presentation and Peer Review (15%) **Practical field work:** Practical reports and essay writing. Preparation reading for practical or field trips, preparation for group presentation, exam preparation. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course provides basic concepts in environmental chemistry underpinning many of the environmental problems humans are faced with, with a focus on agricultural and natural ecosystems.

AGCH3033 is a core unit for the BEnvSys degree and an elective unit suitable for the BScAgr, BResEc and BAnVetBioSc degrees, building on intermediate units in chemistry and biology.

Sources, reactions and fate of chemical species will be investigated in air, water, soil and biota. Case studies about human impacts on the environment will be integrated in the lectures, laboratory classes and field trip.

At the end students have an understanding of chemical concepts that are at the root of many environmental problems in agricultural and natural ecosystems. This unit will provide students with tools to identify and assess the chemistry behind environmental problems and will guide students in developing methods to manage these problems.

Students will enhance their skills in problem definition, assessing sources of information, team-work and effectively communicating environmental issues from a chemical perspective through laboratory reports and oral presentation.

Textbooks

Reference Books: Andrews et al. 2004. An Introduction to Environmental Chemistry.
Van Loon and Duffy. 2010. Environmental Chemistry: A Global Perspective.
Hanrahan. 2011. Key Concepts in Environmental Chemistry.

ANSC3105
Animal Biotechnology

Credit points: 6 **Teacher/Coordinator:** Assoc. Prof. Peter Williamson **Session:** Semester 2 **Classes:** Lectures 3 hours per week, tutorials 1 hour per week, practicals 2-3 hours for seven weeks **Assessment:** Practicals and quizzes (30%), essay and seminars (30%), exam (40%) **Practical field work:** laboratory practical classes **Mode of delivery:** Normal (lecture/lab/tutorial) day

Lectures, tutorials, laboratories, seminars and supervised reading and directed learning instruction will cover the application of biotechnology to animal health, animal production and veterinary biosciences. The course is organised around modules that consider the methodologies, ethical and technical issues in application veterinary regenerative technology (gene therapy; stem cell therapy), transgenic technologies, antibody and antigen receptor engineering, molecular diagnostics, and mining molecular bioactives, all discussed in contexts relevant to domestic animals. The course also integrates an introduction to the emerging field of animal biosystems, which covers the application of big data in animal biotechnology.

ANSC3107
Animal Genetics 3

Credit points: 6 **Teacher/Coordinator:** Prof Claire Wade **Session:** Semester 2 **Classes:** 2 hours of classes per week where there are no on-line modules, 2 hours per week of practicals. Up to eight weeks of semester will be conducted as on-line learning modules. Students requiring extra assistance are encouraged to make an appointment with Prof Wade. **Prerequisites:** GENE2001 or GENE2002 or GEGE2X01 or MBLG2X72 **Assessment:** Practicals with associated reports and on-line quizzes (25%), mid-semester on-line examination (25%), final examination (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Genetics ANSC3107 is an exciting course that explores the technologies used by geneticists in practical situations involving domestic animals. We will expand on concepts learned in GENE2001 to learn more about genome sequencing, variant discovery, phylogenomics, bioinformatics, epigenetics, association mapping, gene therapy and forensic genetics.

Textbooks

There is no prescribed text for this subject.

AREC3001
Production Modelling and Management

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901 **Assessment:** 1x2hr Final Exam (60%), 1x50min Mid-semester Test (15%), 1x1500wd Assignment (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit builds on the principles of biological production economics and introduces optimisation methods to solve decision making problems encountered by agribusiness and natural resource firms and managers in public agencies. The principle focus is on the application of linear programming techniques, and students learn to consider solving decision making problems where the outcomes are not known with certainty, and where the timing of decisions is of essence.

AREC3002
Agricultural Markets

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901 **Assessment:** 1000wd equivalent problem sets (30%), 1x1500wd essay (30%), 1x2hr final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to provide an understanding of the underlying forces driving agricultural markets. It addresses price analysis and efficiency, including aspects of form, time and space in agricultural marketing; information and contracts; changing consumer concerns (food safety, ethical production); futures market and other risk sharing devices. Building on the application of microeconomic theory to both production and consumption in agricultural markets, its content is analytical. The unit also investigates some of the forces which prevent the efficient operation of world agricultural markets, including impediments to trade, imperfect markets for inputs and outputs and market power along the agricultural supply chain.

AVBS3001
Agents of Disease

Credit points: 6 **Teacher/Coordinator:** Dr Gary Muscatello **Session:** Semester 1 **Classes:** lectures 3 hours per week, laboratories/tutorials 2 hours per week, group work 1 hour per week **Prerequisites:** AVBS2001 **Assumed knowledge:** Animal and Veterinary Bioscience years 1-2 **Assessment:** 1500wd individual review (25%), 1000wd scenario-based group assignment (15%), 2 hour exam (50%), MCQ (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to examine and appreciate the diversity of various disease causing agents (microbiological and parasitological) of significance to animal industries and the various strategies employed by those agents in the host-pathogen-environment interaction. This study is based on an understanding of the physical, chemical and genetic characteristics of infectious agents of disease and builds on the pathological and immunological processes taught in AVBS2001 Introductory Veterinary Pathogenesis. A scenario/case based approach will be used whenever possible to enable the students to develop problem solving approaches and skills in critical thinking. Cases selected will be those that best illustrate particular concepts and/or are of particular significance to the animal/veterinary industry. Research and industry focus activities will infuse the subject content and student learning outcomes of this unit. This unit is located at the Camperdown campus.

Textbooks

A Unit of Study outline and LMS will contain detailed information and notes for this unit.

Recommended textbooks: Quinn PJ, Markey BK, Carter ME, Donnelly WJ and Leonard FC, 2011, Veterinary Microbiology and Microbial Disease. Blackwell Science, Oxford
Songer JG and Post KW, 2005, Veterinary Microbiology: Bacterial and Fungal Agents of Animal Disease. Saunders, St Louis
Hirsh DC, MacLachlan NJ and Walker RL, 2004, Veterinary Microbiology, Blackwell Science, Oxford

AVBS3002
Laboratory Disease Investigation

Credit points: 6 **Teacher/Coordinator:** A/Prof Jan Slapeta **Session:** Semester 2 **Classes:** Lectures 2 hours per week, laboratories/tutorials 4 hours per week (note these will vary depending upon the week) **Prerequisites:** 12cp from (MICR2X31 or IMMU2101 or AVBS2001 or AVBS3001) **Assumed knowledge:** CHEM1XXX and BIOL1XXX and ANSC3103 and ANSC3104 and (ENVX2001 or BIOM2001) **Assessment:** Assignments (60%), quiz (15%), theory exam (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to develop an investigative approach and familiarity with laboratory techniques, ethics and safety in preparation for honours or postgraduate training in disease research or disease investigation. Students will work through actual disease research or investigation scenarios via directed and self-directed, individual and group tasks.

Textbooks
There is no set text for this unit. Students will use primary literature and source various library texts as required for their investigations.

AVBS3003
Wildlife Management

Credit points: 6 **Teacher/Coordinator:** Dr Catherine Herbert **Session:** Semester 1 **Classes:** Lectures 3 hours per week, tutorials 2 hours per week on average (consult timetable) **Prerequisites:** 24 credit points from second year core units of study **Assumed knowledge:** All core Units of Study in Year 1 and 2 of BAnVetBioSc degree **Assessment:** Group assignment (20%), individual assignments and tutorial participation (40%), final exam (40%) **Practical field work:** Up to two days of field excursions **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study describes and evaluates key contemporary challenges faced by wildlife management professionals and conservation biologists. A key component of the course is to give students an appreciation of different stakeholder perspectives in wildlife management and how rigorous scientific method can be used to inform wildlife management decisions, using contemporary examples. This unit of study also explores the techniques and methods for undertaking wildlife research, with an emphasis on terrestrial vertebrate species. On completion of this unit, students will have experience in articulating and acknowledging various stakeholder views, both orally and in written form, and understand the processes involved in formulating an evidence-based management approach to contentious wildlife management scenarios.

Textbooks
Students should consult lecturers for recommended reading

BIOL3007
Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3907 **Assessment:** One 2-hour exam, group presentations, one essay, one project report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the dynamics of ecological systems, and considers the interactions between individual organisms and populations, organisms and the environment, and ecological processes. Lectures are grouped around four dominant themes: Interactions, Evolutionary Ecology, The Nature of Communities, and Conservation and Management. Emphasis is placed throughout on the importance of quantitative methods in ecology, including sound planning and experimental designs, and on the role of ecological science in the conservation, management, exploitation and control of populations. Relevant case studies and examples of ecological processes are drawn from marine, freshwater and terrestrial systems, with plants, animals, fungi and other life forms considered as required. Students will have some opportunity to undertake short term ecological projects, and to take part in discussions of important and emerging ideas in the ecological literature.

Textbooks
Begon M, Townsend CR, Harper JL (2005) Ecology, From individuals to ecosystems. Wiley-Blackwell.

BIOL3010
Tropical Wildlife Biology

Credit points: 6 **Teacher/Coordinator:** Dr Matthew Greenless **Session:** Intensive February **Classes:** One week intensive field trip to the Northern Territory plus one week intensive lecture and prac session at Sydney University. **Prerequisites:** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3910 or BIOL2010 or BIOL2910 **Assessment:** One 2-hour theory exam, one 1-hour practical exam, one 1500-word report, one 2000-word paper, one 15-minute oral presentation (100%). **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit runs in February. It cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2017, 2019) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

Australia has a unique terrestrial vertebrate fauna, but also has the worst record of recent mammalian extinctions. Because of Australia's unusual climate, landforms, and the rarity of many species, the management of our native wildlife presents special challenges for biologists, conservationists and land managers. This unit of study addresses the biogeography, ecology and management of Australia's terrestrial fauna. The subject comprises of a five-day field course at Mary River Park in the Northern Territory. During the course, students will learn how to carry out wildlife surveys, how to identify animals, how to track wildlife, and how to design and complete a field experiment. The field trip will be complemented by guest lectures from experts in the fields of evolution, ecology and wildlife management. A one day field trip to Litchfield National Park will be held on the last day of the field course.

BIOL3013
Marine Biology

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 4-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3913 **Assessment:** Practical reports, data exercises and exams (100%). **Practical field work:** Combination of field, lab and computer based practical activities **Mode of delivery:** Normal (lecture/lab/tutorial) day

We will examine in detail processes that are important for the establishment and maintenance of marine communities. Lectures will expose students to the key ideas, researchers and methodologies within selected fields of marine biology. Laboratory sessions and field excursions will complement the lectures by providing students with hands-on experience with the organisms and the processes that affect them. Students will develop critical analysis and scientific writing skills while examining the current literature.

BIOL3018
Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

BIOL2033
Entomology

Credit points: 6 **Teacher/Coordinator:** Dr Tanya Latty **Session:** Semester 2 **Classes:** Two 1-hour lectures; one 3-hour practical sessions a weekly basis **Prohibitions:** ENTO2001 **Assessment:** Practical test, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Insects are the most abundant and diverse group of animals on earth; beetles alone account for 25% of animal life. Insects impact almost every facet of the ecosystem and our lives. Many insects play valuable and essential roles in pollinating different plant species, in predating and controlling insect pests and in recycling nutrients. Other insects are harmful and are the vectors for major diseases such as plague, malaria and recently emerged viral disease Zika. This unit will provide students with a broad introduction to entomology including insect evolution, ecology, anatomy and physiology. Students will learn applied entomological topics such as sustainable insect management in agricultural ecosystems, medical and veterinary entomology, insect-inspired technologies, and insects as a future food source for both livestock and humans. This theoretical background will be complemented by training in how to use and evaluate a range of identification tools such as lucid and traditional dichotomous keys that enable you to identify and classify major groups of insects. Practical classes will allow you to develop your identification, classification and preservation skills though examination of boxes of 'mystery insects' and through creating a museum-quality insect collection. Students will also learn procedures for caring and rearing live insects. By the end of the unit you will be well prepared to work in fields that require entomological skills.

Textbooks

Info will be made available via Blackboard. Keys will be available in practical classes and in the lab Manual

ENVX3002
Statistics in the Natural Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** one 2-hour workshop per week, one 3-hour computer practical per week **Prerequisites:** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 **Assessment:** One exam during the exam period (50%), five assessment tasks (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Interdisciplinary Unit

This unit of study is designed to introduce students to the analysis of data they may face in their future careers, in particular data that are not well behaved. The data may be non-normal, there may be missing observations, they may be correlated in space and time or too numerous to analyse with standard models. The unit is presented in an applied context with an emphasis on correctly analysing authentic datasets, and interpreting the ouput. It begins with the analysis and design experiments based on the general linear model. In the second part, students will learn about the generalisation of the general linear model to accommodate non-normal data with a particular emphasis on the binomial and poisson distributions. In the third part linear mixed models will be introduced which provide the means to analyse datasets that do not meet the assumptions of independent and equal errors, for example data that is correlated in space and time. The units ends with an introduction to machine learning and predictive modelling. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Year 4

Coursework

Enrolment in elective units is subject to prerequisite and corequisite requirements, prohibitions and timetabling constraints.

AGRO4005
Livestock Production Systems

Credit points: 6 **Teacher/Coordinator:** A/Prof Luciano Gonzalez **Session:** Semester 2 **Classes:** One 3-hour lecture followed by one 3-hour practical per week at Camden Campus **Prerequisites:** 6cp from BIOL1XXX **Assumed knowledge:** Junior plant and animal biology (or equivalent), junior chemistry biology, intermediate crop and animal production, nutrition and physiology (or equivalent). **Assessment:** Practical reports (40%), case study assignment (40%), case study presentations (20%). **Practical field work:** Farm consultancy case study, computer lab and field **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines livestock production following a whole system approach by integrating animals, vegetation, environment (soil, water, air and climate) and management, and analysing the interactions between them. The unit builds on principles delivered in core (AGEN1001, AGEN1004 and AGEN2006) and elective (ANSC3101, AVBS4012) units of study for those students interested in pursuing a career in Animal Science. The focus of this unit is on farm business planning and consulting for beef cattle and sheep. Particularities and commonalities of these livestock systems will be presented.

The pasture/grassland section examines the relationship between livestock production, forage quality and quantity in both native and sown pastures, impact of weeds, and grazing management. Interactions between climate, forage and animal production are also addressed. The animal component of this unit integrates concepts in grazing ecology, nutrition, reproduction, animal behaviour and welfare, and economics to develop skills in managing the production process for improved productivity, production efficiency and environmental stewardship. A special characteristic of this unit is the strong focus on simulation models, decision support systems, and new technologies. Computer-based and field classes will provide direct experience in business management of livestock production systems and skills in record keeping and data handling. Students completing this unit will acquire skills to examine and manage livestock enterprises following a whole-system approach required in roles as consultants, advisors or managers of sustainable livestock enterprises.

AGRO4006
New and Emerging Tech in Animal Science

Credit points: 6 **Teacher/Coordinator:** A/Prof Luciano Gonzalez **Session:** Semester 1 **Classes:** One 3-hour lecture followed by one 3-hour practical per week at Camden Campus (practicals include demonstraton and hands-on with remote sensing, GIS and ICT technologies) **Prerequisites:** 6cp from BIOL1XXX **Assessment:** Final Assignment presentation (10%) and document (40%), video proposal for major assignment (10%) and practical reports (computer labs and field classes, 40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to provide students with an advanced understanding of new and emerging livestock technologies in Australia and overseas. Examples of these technologies include (1) next-generation infrared and laser scanning to determine physiological status and whole body composition, (2) diet formulation to enhance the nutritional and eating quality of livestock food products, (3) new vaccines and other therapeutics to regulate fertility, growth and behaviour whilst enhancing welfare and wellbeing, (4) microRNA technology to influence cellular, endocrine and physiological processes, (5) new genomics and laboratory-based reproductive technologies for advanced livestock breeding, (6) technologies to monitor and control animal behaviour, (7) unmanned ground and aerial vehicles to monitor livestock and the environment, (8) sensors and advanced image-capture technology to record the attributes of soil, air and the feedbase, (9) data-fusion science to integrate, analyse and interpret collected data, and (10) modelling of livestock systems. Students will gain research and inquiry skills through research based group projects, information literacy and communication skills through on-line discussion postings, laboratory reports and presentations, and personal and intellectual autonomy through working in groups. At successful completion of the unit students will have a sound knowledge of new and emerging technologies that will shape the livestock industries in Australia and overseas. This will provide valuable grounding for students preparing for postgraduate study and other learning and career paths.

Textbooks

No prescribed text but referral to references listed from library

AGEN5001
Agricultural and Environmental Extension

Credit points: 6 **Teacher/Coordinator:** Dr Peter Ampt **Session:** Semester 1 **Classes:** One 2-hour lecture per week, one 2-hour tutorial per week, one field trip (three days) **Assessment:** 1500wd essay (20%), tutorial/workshop participation (30%), 3000wd problem based learning project (30%), field trip report (20%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will develop knowledge, skills and understanding for engaging effectively with the people whose decisions shape innovation in agricultural production and environmental management. The role of extension in agricultural and environmental management is a crucial aspect of sustainability, as extension agents provide the main conduit between scientists, economists and policymakers and the people who live and work in the landscape.

It develops key graduate competencies in communication and soft systems for careers including consulting, agribusiness, agricultural extension, environmental management, policy, participatory research and natural resource management. It covers integrative aspects of extension theory and practice, social learning, sustainable agriculture, knowledge domains, participatory action research, human geography, soft systems thinking and adaptive natural resource management. It is relevant to students pursuing agricultural and environmental streams and majors at both undergraduate and postgraduate level.

Students will learn to: describe and discuss the theoretical and practical underpinnings of extension; describe and analyse factors influencing the behaviours, attitudes and beliefs of natural resource managers; discuss and design effective extension programs/projects; conduct, analyse and evaluate simple surveys, focus groups and semi-structured interviews; critically evaluate the integration of conservation and production in the landscape; facilitate sustainable change.

Textbooks

Recommended reading, Jennings, J., Packham R. and Woodside, D.(eds) (2001) Shaping Change APEN; Hay, I (2012) Communicating in Geography and the Environmental Sciences, Oxford

ANSC3106
Animal Behaviour and Welfare Science 3

Credit points: 6 **Teacher/Coordinator:** Dr Greg Cronin **Session:** Semester 2 **Classes:** 6 hours per week (including lectures, demonstrations, discussions and practical activities); classes will be held at the Camden campus **Prerequisites:** AVBS1002 **Assessment:** Assignments/presentations (50%), theory exam (50%) **Practical field work:** Practical class activities will be held at the May Farm pig unit and Camden poultry research unit, and there will be a full day excursion to Symbio Wildlife Zoo **Mode of delivery:** Normal (lecture/lab/tutorial) day

In Animal Behaviour and Welfare Science 3, the behavioural and physiological responses of mammals, birds and fish to stressors related to husbandry, housing, transport and slaughter are explored in some detail. This Unit enables students to develop an appreciation of the responses of animals to common interventions that arise in the context of interacting with humans, including the domestication of livestock species and the management of wildlife. The principles of animal responses to stress are illustrated with production species as the main examples. Contemporary approaches to the scientific measurement of animal stress and welfare, based on an appropriate selection of scientific disciplines including ethology, psychology, physiology and neuroscience, are assessed with an emphasis on farmed livestock species. Genetic, environmental and evolutionary determinants of pain, stress and fear responses in animals are considered in the light of what is known about cognition and motivation in animals. Methods for assessing and enhancing animal environments and husbandry systems are examined and the impact on animal behaviour and welfare of stockmanship is explored in the context of human-animal interactions. Finally, the design and conduct of scientific experiments are assessed with a focus on animal ethics and current welfare issues.

Textbooks

Broom, DM and Fraser, AF 2007, Domestic animal behaviour and welfare, 4th edition, CAB International, Cambridge Uni Press, Cambridge

A Unit of Study outline containing details of lecture outlines, objectives, reference lists, details of practical classes, staffing as well as other relevant class material will be available for students

AVBS4001
Animal Health and Disease

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Muir **Session:** Semester 1 **Classes:** 3.5 hours per week lectures, tutorials 0.5 hours per week, practicals 2 hours per week (on average) **Prerequisites:** AVBS2001 and AVBS3001 **Assessment:** Participation in field trips (pass/fail), assignments (60%), 2-hour exam (40%) **Practical field work:** Two day overnight field trip to Arthursleigh, University of Sydney property **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study extends your understanding of animal health from knowledge gained in units completed in earlier years, including AVBS2001 Introduction to Veterinary Pathogenesis and AVBS3001 Agents of disease. In particular we look at general aspects of animal health and disease in terms of epidemiology, exotic/emergency diseases of risk to Australia and principles of vaccines and vaccinations. Health and disease issues relevant to various species, including sheep, cattle, pigs, poultry, fish and wildlife are presented by experts in these fields. A range of management and interventional strategies that are currently in use to minimise the impact of disease are also discussed. After completing this Unit of Study, students will demonstrate an understanding of:

the principles of animal management that are implemented to optimise health and to reduce the incidence and severity of disease; the fundamental principles of disease in animal populations; specific infectious diseases of consequence for growth, reproduction and for the production of meat, wool, milk and eggs; approaches to their control and prevention through environmental and nutritional management, and interventional techniques such as vaccination programmes. These are considered in the context of commercial animal production and the health of wildlife animals. A two day field trip to Arthursleigh farm which focuses on the management of sheep, cattle and wildlife, and a visit to the research and development field station of an international animal health company reiterate many aspects of the unit of study.

Textbooks

Students are advised to consult lecturers for recommended texts

AVBS4002
Dairy Production and Technology

Credit points: 6 **Teacher/Coordinator:** Prof Sergio (Yani) Garcia **Session:** Semester 2 **Classes:** Lectures up to 3 hours per week, practicals 3 hours per week **Assumed knowledge:** Enrolled students are expected to have some understanding of key components of the dairy production system, including basic knowledge of animal physiology and nutrition. **Assessment:** Assignment (report or lit review) (30%), pracs assessments, (30%), 1-hour exam (40%) **Practical field work:** At least two half day field trips and one or two full day trips/excursions including commercial farms and a milk processing plant **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the various aspects of dairy farming and the dairy industry from a scientific point of view. The lectures are a mix of the principles on which sound dairy farming is based and practical examples of how this operates in practice. Focus is placed on integrating knowledge to gain understanding on the system of production as a whole. At the end of this unit of study, students will demonstrate a solid understanding of: the characteristics of the dairy industry in Australia and in a world wide context; the key components of pasture-based dairy systems; principles and practices of pasture and feeding management; the application of new technologies to improve efficiency and productivity (particularly automatic milking). In addition, students will demonstrate an appreciation of key aspects of reproduction and lactation physiology; the integration of knowledge of genetics and reproduction into the type of herd improvement structure set up in the dairy industry; the application of ruminant physiology knowledge to developing feeding programs for dairy cows; the extension of basic reproductive physiology onto the dairy farm using case studies as examples; the economics of the dairy farm business. Practical classes include milking cows; grazing and feeding management of dairy cows; calf rearing; and visits to commercial farms ranging from small pasture-based dairy farms to a feed-lot operation milking over 2,000 cows.

Textbooks

Students are advised to consult lecturers for recommended text, scientific and professional articles, technotes for advisors and industry-generated information for farmers

AVBS4003
Wildlife and Evolutionary Genetics

Credit points: 6 **Teacher/Coordinator:** A/Prof Jaime Gongora **Session:** Semester 2 **Classes:** On average 6 hours per week of lectures, tutorials, computer simulations and practical classes. This unit will be taught at the Camperdown campus **Assessment:** Written and oral assignment (30%), practical reports/class contribution (20%), final written exam (50%) **Practical field work:** Laboratory practicals, bioinformatic analyses and fieldtrip to a park in the Sydney or NSW areas **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study focuses on the role and animal and veterinary biosciences in the field of wildlife management management and diseases using project-based, open learning space and research-led teaching approaches. The unit encourages an approach that spans management, wildlife biology and laboratory sciences. In recognition of the power of genetics as a tool in wildlife management and research, a large component of this course reviews fundamental genetic, genomic and immunogenetic principals and their application to understanding, managing and conserving wildlife. This unit also covers themes in Indigenous knowledges related to animal management and conservation as well as cultural competence. At the end of this unit of study, students will demonstrate an understanding of: important issues in wildlife management in Australia and the Asia-pacific region; project management as it applies to multifaceted wildlife research and management issues; application of a range of genetic and physiological methods to the study of ecological issues; the use of appropriate analytical methods and molecular markers in wildlife conservation and management; the underlying genetic structural design of the natural world and how this reflects and influences evolutionary processes in healthy and diseased populations; the use of molecular information to test hypotheses about evolutionary, ecological and social structure of species; how to critically review the ways in which genetic principals are applied to the management and conservation of species; the use of appropriate analytical methods and molecular markers in wildlife conservation and management; how to conduct an investigation into a management problem in wildlife including project design and management recommendations. Students are expected to immerse themselves into the field of conservation, evolutionary genetics and wildlife to develop the ability to critically evaluate the subject. There will be a substantial amount of reading required for the course. There is no formal text; students will be directed to a recommended reading list of both primary and secondary literature.

Textbooks

Readings to be advised in the Unit of Study outline.

AVBS4004
Food Safety Assessment and Management

Credit points: 6 **Teacher/Coordinator:** Dr Gary Muscatello **Session:** Semester 2 **Classes:** Lectures 3 hours per week, tutorial/practicals 2 hours per week **Prerequisites:** AVBS3001 and AVBS4001 **Assessment:** 1000wd individual report (20%), 1000wd group assignment (20%), 2-hour exam (50%), MCQ (10%) **Practical field work:** Two field trips (compulsory) 16 hours total **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study focuses on the issues and practices in the animal industry relevant to food safety and zoonotic disease. This unit will cover general food safety issues, including risk assessment and hazard analysis of microbes and chemicals. Food-borne diseases of animal origin and their impact on public heath will be explored through the examination of zoonotic diseases in scenario-based learning activities. In these processes diagnostic and strategic methods of investigating, controlling and preventing food-borne disease outbreaks will be explored. Students will be introduced to national and international animal and human health policy pertaining to food safety regulations and surveillance initiatives and strategies that underpin these policies. Students in this unit will be introduced to the issues regarding emerging food-borne pathogens and current industry driven topics. By the end of the unit, students should have global and local perspective on the major food-borne diseases, surveillance and control programs. This unit is located at the Camden Campus.

Textbooks

Torrence ME and Isaacson RE (eds) 2003, Microbial food safety in animal agriculture current topics, Iowa State Press, Ames, Iowa
D'Mello JPF (ed.) 2003, Food safety: contaminants and toxins, CABI Publishing, Wallingford
Bucic S 2006, Integrated food safety and veterinary public health, CABI Publishing, Wallingford
Jay JM, Loessner MJ, Golden DA 2005, Modern Food Microbiology, 7th edn, Springer, New York
Colville J, Berryhill, D 2007, Handbook of Zoonoses - Identification and Prevention, Elsevier Mosby, St.Louis, MO USA

AVBS4005
Feed Technology

Credit points: 6 **Teacher/Coordinator:** Dr Cormac OÂ¿Shea **Session:** Semester 1 **Classes:** Lectures three hours per week **Prerequisites:** ANSC3101 **Assessment:** Debate (10%), one page argument (10%), article (15%), lab book and feed formulation exercises (25%), 2-hour written exam (40%) **Practical field work:** Practicals/field work 3hrs/wk **Mode of delivery:** Normal (lecture/lab/tutorial) day

Feed accounts for approximately 70% of the input costs associated with animal industries, including both monogastric (poultry and pigs, laboratory animals) ruminants (feedlot cattle and sheep) and caecal fermenters (horses, rabbits). The "feed industry" is described as the largest supporting industry for animal agriculture and is a major employer of graduates (undergraduate and postgraduate). Feed technology is a broad topic and includes aspects of feed ingredient characteristics, feed manufacturing, feed additive biotechnology and applied nutrition. The course will provide in-depth understanding of the feed industry, factors influencing ingredient variability and availability (physical and economic), methods and applications of processing of ingredients to increase nutritional value, assessment of digestibility, and feed additives and supplements. All facets of the production and regulation of feed production will be discussed relative to their importance in animal agriculture and food production. Expect applied practical information as well as fairly detailed nutritional biochemistry.

Textbooks

No textbook required

AVBS4008
Intensive Animal Industries

Credit points: 6 **Session:** Semester 2 **Classes:** 6 hours per week **Prerequisites:** (Animal and Veterinary Bioscience years 1-3) OR (Bachelor of Science in Agriculture years 1-3) **Assessment:** Written exam (50%) (poultry and pigs 50:50), in course evaluations and case study - pigs (25%), broiler growth study report and in course evaluations - poultry (25%) **Practical field work:** Visits to an intensive pig/poultry farm, feed mill and poultry production and processing units when biosecurity restrictions allow **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is composed of two parts, a Poultry Production component and a Pig Production component. The course will provide students with a comprehensive overview of the production of eggs and poultry meat and pork. The individual components examine various aspects of the poultry and pig production systems important in maintaining efficiency and profitability. It investigates aspects of breeding, nutrition, housing, growth performance, heath, welfare, reproductive capability, waste management, marketing and current industry issues. This unit will expand on some aspects of previous year 3 units of study in animal structure and function, nutrition and reproduction. There is a broiler growth study which comprises a significant part of the practical work in the Poultry component. There is a strong emphasis on assessment being built into the course work as this is considered to be more relevant to learning in the final year.

Textbooks

There is no single text that adequately covers the Australian pig industry and for this reason no formal text is required.

AVBS4009
Aquaculture

Credit points: 6 **Teacher/Coordinator:** Dr Joy Becker **Session:** Semester 1 **Classes:** Lectures 2 hours per week, tutorials 1 hour per week, practicals 3 hours per week **Prerequisites:** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3 **Assessment:** Written and/or oral assignments (50%), exam 2.5 hours (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The Unit of Study explores in detail aspects of commercial aquaculture, including global trends in aquaculture development. Other topics include water quality, feeding, management, health and disease, genetics and reproduction, environmental impact and economic constraints to production. The unit of study emphasises methods to improve aquacultural productivity. It builds on basic principles of anatomy, physiology, nutrition, genetics and health and disease presented in other units of study in BAnVetBioSc. At the end of this Unit of Study, students will demonstrate an understanding of the principles of: the context of aquaculture in global food production; husbandry, management and welfare of aquaculture species; comparative aspects of husbandry in aquaria, domestic, commercial; health and disease relevant to aquaculture; nutrition of aquaculture species; reproduction and genetics of species in aquaculture; water quality and environmental impact of aquaculture; economics and marketing of aquaculture products.

AVBS4012
Extensive Animal Industries

Credit points: 6 **Teacher/Coordinator:** A/Prof Russell Bush **Session:** Semester 1 **Classes:** Lectures 3 hours per week, practicals 3 hours per week **Prerequisites:** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3 **Assessment:** Case study (10%), practical report (15%), meat grading (15%), excursion report (20%) and written exam (40%) **Practical field work:** Five-day study tour to the Riverina **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces the concepts of sheep (wool and meat) and beef cattle production in the Australian environment within the context of world food and fibre consumption and production. The key products as well as domestic and export markets for these are presented. The course provides an historical perspective of the basis for each of these industries and describes each of the production systems designed to meet the demand for these products.

Production in both the tropical and temperate regions of Australia will be covered and include the key elements of extensive grazing and intensive feedlot systems. Major issues will include breeds and breeding systems, basic nutrition and production practices and animal welfare issues as they affect the quality and quantity of product marketed.

The concepts of first stage processing of both meat and fibre products in abattoirs and top-making plants respectively will be presented. The major factors that influence the quality of product and therefore grading and market demand will be presented.

Lecture material will be supported with appropriate practical classes and a 5 day study tour to the Riverina to evaluate different commercial production systems. Students will also have an opportunity to compete in the annual Inter Collegiate Meat Judging (ICMJ) competition as a member of the University of Sydney team. This competition involves teams from numerous universities throughout Australia as well as Japan and the USA.

AVBS4019
Equine Science and Industry

Credit points: 6 **Teacher/Coordinator:** Dr Natasha Hamilton **Session:** Semester 2 **Classes:** One day a week, variable **Assessment:** Assignments (50%), mid-semester and final examinations (50%) **Practical field work:** Two offsite excursions to a racetrack and a commecrial horse stud **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study will give students wishing to work in the equine industries a strong scientifically based grounding in this field. The emphasis is on developing the students' basic knowledge of equine management, including day to day care, nutrition, reproduction, behaviour and training, disease and exercise physiology. Students will be introduced to the structure of equine industries in Australia, and basic horse handling and husbandry skills will be taught.

Textbooks

Equine Science, Pillner and Davies

BIOL3018
Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

BIOM4003
Matrix Algebra and Linear Models

Credit points: 6 **Teacher/Coordinator:** A/Prof Peter Thomson **Session:** Semester 1 **Classes:** One 3-hour workshop per week, three 1-day workshops (exam period) **Prerequisites:** ENVX3002 **Assessment:** Two data analysis projects (50% each) **Mode of delivery:** Block mode

In order to obtain a deeper understanding of statistics it is necessary to learn more about matrices as used to develop and explain statistical and mathematical concepts. Matrices are not just used in statistics: they find use in mathematical models in biology (e.g. age structured population growth models), engineering (e.g. structural perturbation analysis), and economic models (e.g. decision analysis). There are three aims to this unit. Firstly, we will revise matrices learnt in earlier units and then introduce new concepts such as special matrices (symmetric, orthogonal, idempotent), rank, eigenvalues and eigenvectors, as well as some matrix and vector calculus. The second aim is to apply these techniques to the formulation of linear models and linear mixed models which have been introduced in earlier units. The underlying theory will be developed along with more advanced applications. The third aim is to provide an introduction to key application areas for the future; (i) the analysis of big datasets, ones with many predictor variables, and (ii) the analysis of spatial data. Furthermore, the students will be introduced to R, an open source statistical software package.

Textbooks

Textbooks: None. Many reference books such as:

Draper, N.R., and Smith, H. (1981). Applied Regression Analysis, Second edition. N.Y.: Wiley

Graybill, F.A. (1969). Introduction to Matrices with Applications in Statistics. Belmont: Wadsworth

Harville, D.A. (1997). Matrix Algebra from a Statistician's Perspective. New York: Springer

Healy, M.J.R. (1986). Matrices for Statistics. Oxford: Clarendon

Mead, R. (1988). The Design of Experiments. Cambridge: Cambridge U.P

Neter, J., Wasserman, W., and Kutner, M.H. (1985). Applied Linear Statistical Models. Homewood, Il.: Irwin

Searle, S.R. (1982). Matrix Algebra Useful for Statistics. N.Y.: Wiley

GENE4015
Cytogenetics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp (animal component coordinator), A/Prof Jaime Gongora **Session:** Intensive July **Classes:** Equivalent of two lectures/tutorials and three practicals per week **Prerequisites:** (BIOM2001 or ENVX2001) and (GENE2001 or GENE2002) **Assessment:** One 1500wd essay (25%), one 750wd practical report (10%) and one 1000wd fact sheet (15%), one 1200wd laboratory report (20%), one 2000wd assignment (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a final year elective in the two degrees, BScAgr, and BAnVetBiosci. Approximately a half of the face-to-face contact hours will be given as an intensive, and this section of the unit will be held during the mid-year break before semester 2. Lecture and practical work in cytogenetics, especially of plant and animal species of applied interest in plant agriculture, animal agriculture and other applied interest in animal genetics, such as companion, native and endangered species. The lecture component covers the molecular nature of chromosomes and their transmission, variation in chromosome behaviour, both normal and disease related. In addition, the uses of chromosome engineering to produce variation in plants and animals will also be covered. The practical component covers the technologies used to study chromosomes or both plants and animals, both mitotic and meiotic chromosomes, and molecular techniques such as in situ hybridisation, gene activity and chromosomal protein localisation. On completion, students will be able to apply cytogenetic knowledge and technologies to species of eukaryotes of economic significance, and know how cytogenetic processes have affected the development of these species.

Honours

Students in the Honours program enrol in 24 credit points of year 4 coursework units (including any major units), and the following four units of study:

AVBS4015
Research Project A1

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Muir **Session:** Semester 1, Semester 2 **Classes:** Students must attend the compulsory course "Introduction to Animal Research (ITAR)" which is usually held in the week prior to the start of semester. There is no regular face-to-face teaching. The equivalent of 6 hours per week will be allocated from the course work timetable for research project activity. Relevant workshops, for example on scientific writing and statistical analysis will be completed during the sessions when the student is enrolled in AVBS4015, AVBS4016, AVBS4017 and AVBS4018. **Prerequisites:** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **Corequisites:** AVBS4016 and AVBS4017 and AVBS4018 **Prohibitions:** AVBS4013 or AVBS4014 **Assessment:** written preliminary research proposal, literature review on the research topic, oral presentation on the research proposal, oral presentation on the research at the end of the project, research capabilities, written manuscript (assessment tasks scheduled throughout the four units comprising Research Project A (AVBS4015, AVBS4016, AVBS4017, ABVS4018) with the final grade averaged over all four units) **Practical field work:** Dependent on the particular research project **Mode of delivery:** Normal (lecture/lab/tutorial) day

Research Project A is composed of 24 credit points and consists of units AVBS4015 (Research Project A1), AVBS4016 (Research Project A2), AVBS4017 (Research Project A3) and AVBS4018 (Research Project A4). The units need to be taken in chronological order, commencing with enrolment in unit AVBS4015, which must be completed in a semester prior to unit AVBS4018. All four units are connected to the overall completion of the research project. Prior to start of this unit of study, students after consultation with an academic(s) and/or researcher(s) choose an area of research interest and this will form the basis of the entire Research Project A program (24 credit points in total). In unit AVBS4015 students will be required to undertake assessment tasks and conduct research activities.

At the end of this Unit of Study, students will:

Identify a research area, define a problem that impacts on animals and analyse this problem using information from various sources; critically evaluate current research (experimental design, statistical analysis, technical limitations) and identify where the present knowledge limiting for the chosen research topic; assimilate and manage information from within and across disciples to provide new concepts or understanding in the area of research; become familiar with scientific principles of research and the ethical use of animals in research; undertake research related to the project; meet set assessment tasks designed to develop written and oral presentation skills; apply the range of interpersonal skills necessary to work with peers and other researchers; meet deadlines and maintain accurate records related to the project.

Textbooks

No textbooks are required

AVBS4016
Research Project A2

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Muir **Session:** Semester 1, Semester 2 **Classes:** There is no regular face-to-face teaching. The equivalent of 6 hours per week will be allocated from the course work timetable for research project activity. Relevant workshops, for example on scientific writing and statistical analysis will be completed during the sessions when the student is enrolled in AVBS4015, AVBS4016, AVBS4017 and AVBS4018. **Prerequisites:** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **Corequisites:** AVBS4015 and AVBS4017 and AVBS4018 **Prohibitions:** AVBS4013 or AVBS4014 **Assessment:** See AVBS4015 **Practical field work:** Dependent on the particular research project **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students will actively work on the research projects identified at the start of unit AVBS4015. This is will include, where appropriate, undertaking animal and laboratory studies, collection and analysis of samples and data, recording of data, continue to evaluate information from various sources and meet set assessment deadlines.

See under AVBS4015 for further information.

AVBS4017
Research Project A3

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Muir **Session:** Semester 1, Semester 2 **Classes:** The equivalent of 6 hours per week will be allocated from the coursework timetable for research project activity. Relevant workshops, for example on scientific writing and statistical analysis will be completed during the sessions when the student is enrolled in AVBS4015, AVBS4016, AVBS4017 and AVBS4018 **Prerequisites:** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **Corequisites:** AVBS4015 and AVBS4016 and AVBS4018 **Prohibitions:** AVBS4013 or AVBS4014 **Assessment:** See AVBS4015 **Practical field work:** Dependent on the particular research project **Mode of delivery:** Normal (lecture/lab/tutorial) day

See under AVBS4015 and AVBS4016.

AVBS4018
Research Project A4

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Muir **Session:** Semester 1, Semester 2 **Classes:** There is no regular face-to-face teaching. The equivalent of 6 hours per week will be allocated from the coursework timetable for research project activity. Relevant workshops, for example on scientific writing and statistical analysis will be completed during the sessions when the student is enrolled in AVBS4015, AVBS4016, AVBS4017 and AVBS4018. **Prerequisites:** Animal and Veterinary Bioscience years 1-3. Students need to have obtained a second/third year WAM commensurate with obtaining honours; and must have the approval of the faculty to enrol. **Corequisites:** AVBS4015 and AVBS4016 and AVBS4017 **Prohibitions:** AVBS4013 or AVBS4014 **Assessment:** See AVBS4015 **Practical field work:** Dependent on the particular research project **Mode of delivery:** Normal (lecture/lab/tutorial) day

See under AVBS4015 and AVBS4016. Students must complete unit AVBS4018 in a separate semester to unit AVBS4015, and AVBS4015 must be completed prior to AVBS4018.

Bachelor of Animal and Veterinary Bioscience Majors

Unit of study descriptions

Core

All students undertake the following:

AVBS3000
Professional Development

Credit points: 6 **Teacher/Coordinator:** Dr Sabrina Lomax **Session:** Semester 1, Semester 2 **Classes:** Six preparatory workshops/seminars (throughout years 1-3), four 1-hour industry seminars for case studies (year 3) **Assessment:** Professional experience reports (65%), case studies (20%), essay on current animal issues (15%) **Practical field work:** 60 days of professional work experience to be completed by the commencement of fourth year **Mode of delivery:** Professional practice

Students are required to undertake professional development in University vacations as an integral and essential part of their overall training in the degree of Bachelor of Animal and Veterinary Bioscience. Students will complete 60 days of professional work experience throughout their program by the commencement of fourth year, including a minimum of 20 days spent on commercial animal production enterprises. Students will visit at least two different farming enterprises in the major and emerging animal production industries. The remaining 40 days will include at least one placement with an animal-related business or service provider, and experience in either a scientific research organisation or short scientific volunteer position. Students will undertake additional placements at relevant animal or animal-related businesses, farms or organisations as required to complete 60 days. A professional consultant-style report must be submitted after each placement. Seminars to promote awareness of career options and current issues in animal science will be provided on a regular basis by past graduates and other professionals working in the animal industries. Students are encouraged to attend as many of these as possible throughout their degree program, and are required to submit four case studies based on material presented in these seminars. Attendance at seminars is compulsory during third year. Students will also submit an essay on a current issue in the animal science area of their choice.

Textbooks
On-line resource material will be available

Students must complete the relevent core units of study from the associated major list below. Additional Years 3 and 4 electives may be selected from the Elective List.

Table 1: Animal Genetics and Biotechnology major

Comprises 24 credit points, of which ANSC3105 and ANSC3107 are compulsory.

ANSC3105
Animal Biotechnology

Credit points: 6 **Teacher/Coordinator:** Assoc. Prof. Peter Williamson **Session:** Semester 2 **Classes:** Lectures 3 hours per week, tutorials 1 hour per week, practicals 2-3 hours for seven weeks **Assessment:** Practicals and quizzes (30%), essay and seminars (30%), exam (40%) **Practical field work:** laboratory practical classes **Mode of delivery:** Normal (lecture/lab/tutorial) day

Lectures, tutorials, laboratories, seminars and supervised reading and directed learning instruction will cover the application of biotechnology to animal health, animal production and veterinary biosciences. The course is organised around modules that consider the methodologies, ethical and technical issues in application veterinary regenerative technology (gene therapy; stem cell therapy), transgenic technologies, antibody and antigen receptor engineering, molecular diagnostics, and mining molecular bioactives, all discussed in contexts relevant to domestic animals. The course also integrates an introduction to the emerging field of animal biosystems, which covers the application of big data in animal biotechnology.

ANSC3107
Animal Genetics 3

Credit points: 6 **Teacher/Coordinator:** Prof Claire Wade **Session:** Semester 2 **Classes:** 2 hours of classes per week where there are no on-line modules, 2 hours per week of practicals. Up to eight weeks of semester will be conducted as on-line learning modules. Students requiring extra assistance are encouraged to make an appointment with Prof Wade. **Prerequisites:** GENE2001 or GENE2002 or GEGE2X01 or MBLG2X72 **Assessment:** Practicals with associated reports and on-line quizzes (25%), mid-semester on-line examination (25%), final examination (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Genetics ANSC3107 is an exciting course that explores the technologies used by geneticists in practical situations involving domestic animals. We will expand on concepts learned in GENE2001 to learn more about genome sequencing, variant discovery, phylogenomics, bioinformatics, epigenetics, association mapping, gene therapy and forensic genetics.

Textbooks
There is no prescribed text for this subject.

and at least two of the following:

AVBS4003
Wildlife and Evolutionary Genetics

Credit points: 6 **Teacher/Coordinator:** A/Prof Jaime Gongora **Session:** Semester 2 **Classes:** On average 6 hours per week of lectures, tutorials, computer simulations and practical classes. This unit will be taught at the Camperdown campus **Assessment:** Written and oral assignment (30%), practical reports/class contribution (20%), final written exam (50%) **Practical field work:** Laboratory practicals, bioinformatic analyses and fieldtrip to a park in the Sydney or NSW areas **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study focuses on the role and animal and veterinary biosciences in the field of wildlife management management and diseases using project-based, open learning space and research-led teaching approaches. The unit encourages an approach that spans management, wildlife biology and laboratory sciences. In recognition of the power of genetics as a tool in wildlife management and research, a large component of this course reviews fundamental genetic, genomic and immunogenetic principals and their application to understanding, managing and conserving wildlife. This unit also covers themes in Indigenous knowledges related to animal management and conservation as well as cultural competence. At the end of this unit of study, students will demonstrate an understanding of: important issues in wildlife management in Australia and the Asia-pacific region; project management as it applies to multifaceted wildlife research and management issues; application of a range of genetic and physiological methods to the study of ecological issues; the use of appropriate analytical methods and molecular markers in wildlife conservation and management; the underlying genetic structural design of the natural world and how this reflects and influences evolutionary processes in healthy and diseased populations; the use of molecular information to test hypotheses about evolutionary, ecological and social structure of species; how to critically review the ways in which genetic principals are applied to the management and conservation of species; the use of appropriate analytical methods and molecular markers in wildlife conservation and management; how to conduct an investigation into a management problem in wildlife including project design and management recommendations. Students are expected to immerse themselves into the field of conservation, evolutionary genetics and wildlife to develop the ability to critically evaluate the subject. There will be a substantial amount of reading required for the course. There is no formal text; students will be directed to a recommended reading list of both primary and secondary literature.

Textbooks

Readings to be advised in the Unit of Study outline.

BIOL3018
Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

GENE4015
Cytogenetics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp (animal component coordinator), A/Prof Jaime Gongora **Session:** Intensive July **Classes:** Equivalent of two lectures/tutorials and three practicals per week **Prerequisites:** (BIOM2001 or ENVX2001) and (GENE2001 or GENE2002) **Assessment:** One 1500wd essay (25%), one 750wd practical report (10%) and one 1000wd fact sheet (15%), one 1200wd laboratory report (20%), one 2000wd assignment (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a final year elective in the two degrees, BScAgr, and BAnVetBiosci. Approximately a half of the face-to-face contact hours will be given as an intensive, and this section of the unit will be held during the mid-year break before semester 2. Lecture and practical work in cytogenetics, especially of plant and animal species of applied interest in plant agriculture, animal agriculture and other applied interest in animal genetics, such as companion, native and endangered species. The lecture component covers the molecular nature of chromosomes and their transmission, variation in chromosome behaviour, both normal and disease related. In addition, the uses of chromosome engineering to produce variation in plants and animals will also be covered. The practical component covers the technologies used to study chromosomes or both plants and animals, both mitotic and meiotic chromosomes, and molecular techniques such as in situ hybridisation, gene activity and chromosomal protein localisation. On completion, students will be able to apply cytogenetic knowledge and technologies to species of eukaryotes of economic significance, and know how cytogenetic processes have affected the development of these species.

Table 2: Animal Health and Disease Major

Comprises 24 credit points:

AVBS3001
Agents of Disease

Credit points: 6 **Teacher/Coordinator:** Dr Gary Muscatello **Session:** Semester 1 **Classes:** lectures 3 hours per week, laboratories/tutorials 2 hours per week, group work 1 hour per week **Prerequisites:** AVBS2001 **Assumed knowledge:** Animal and Veterinary Bioscience years 1-2 **Assessment:** 1500wd individual review (25%), 1000wd scenario-based group assignment (15%), 2 hour exam (50%), MCQ (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to examine and appreciate the diversity of various disease causing agents (microbiological and parasitological) of significance to animal industries and the various strategies employed by those agents in the host-pathogen-environment interaction. This study is based on an understanding of the physical, chemical and genetic characteristics of infectious agents of disease and builds on the pathological and immunological processes taught in AVBS2001 Introductory Veterinary Pathogenesis. A scenario/case based approach will be used whenever possible to enable the students to develop problem solving approaches and skills in critical thinking. Cases selected will be those that best illustrate particular concepts and/or are of particular significance to the animal/veterinary industry. Research and industry focus activities will infuse the subject content and student learning outcomes of this unit. This unit is located at the Camperdown campus.

Textbooks

A Unit of Study outline and LMS will contain detailed information and notes for this unit.

Recommended textbooks: Quinn PJ, Markey BK, Carter ME, Donnelly WJ and Leonard FC, 2011, Veterinary Microbiology and Microbial Disease. Blackwell Science, Oxford

Songer JG and Post KW, 2005, Veterinary Microbiology: Bacterial and Fungal Agents of Animal Disease. Saunders, St Louis

Hirsh DC, MacLachlan NJ and Walker RL, 2004, Veterinary Microbiology, Blackwell Science, Oxford

AVBS3002
Laboratory Disease Investigation

Credit points: 6 **Teacher/Coordinator:** A/Prof Jan Slapeta **Session:** Semester 2 **Classes:** Lectures 2 hours per week, laboratories/tutorials 4 hours per week (note these will vary depending upon the week) **Prerequisites:** 12cp from (MICR2X31 or IMMU2101 or AVBS2001 or AVBS3001) **Assumed knowledge:** CHEM1XXX and BIOL1XXX and ANSC3103 and ANSC3104 and (ENVX2001 or BIOM2001) **Assessment:** Assignments (60%), quiz (15%), theory exam (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to develop an investigative approach and familiarity with laboratory techniques, ethics and safety in preparation for honours or postgraduate training in disease research or disease investigation. Students will work through actual disease research or investigation scenarios via directed and self-directed, individual and group tasks.

Textbooks

There is no set text for this unit. Students will use primary literature and source various library texts as required for their investigations.

AVBS4001
Animal Health and Disease

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Muir **Session:** Semester 1 **Classes:** 3.5 hours per week lectures, tutorials 0.5 hours per week, practicals 2 hours per week (on average) **Prerequisites:** AVBS2001 and AVBS3001 **Assessment:** Participation in field trips (pass/fail), assignments (60%), 2-hour exam (40%) **Practical field work:** Two day overnight field trip to Arthursleigh, University of Sydney property **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study extends your understanding of animal health from knowledge gained in units completed in earlier years, including AVBS2001 Introduction to Veterinary Pathogenesis and AVBS3001 Agents of disease. In particular we look at general aspects of animal health and disease in terms of epidemiology, exotic/emergency diseases of risk to Australia and principles of vaccines and vaccinations. Health and disease issues relevant to various species, including sheep, cattle, pigs, poultry, fish and wildlife are presented by experts in these fields. A range of management and interventional strategies that are currently in use to minimise the impact of disease are also discussed. After completing this Unit of Study, students will demonstrate an understanding of:

the principles of animal management that are implemented to optimise health and to reduce the incidence and severity of disease; the fundamental principles of disease in animal populations; specific infectious diseases of consequence for growth, reproduction and for the production of meat, wool, milk and eggs; approaches to their control and prevention through environmental and nutritional management, and interventional techniques such as vaccination programmes. These are considered in the context of commercial animal production and the health of wildlife animals. A two day field trip to Arthursleigh farm which focuses on the management of sheep, cattle and wildlife, and a visit to the research and development field station of an international animal health company reiterate many aspects of the unit of study.

Textbooks

Students are advised to consult lecturers for recommended texts

AVBS4004
Food Safety Assessment and Management

Credit points: 6 **Teacher/Coordinator:** Dr Gary Muscatello **Session:** Semester 2 **Classes:** Lectures 3 hours per week, tutorial/practicals 2 hours per week **Prerequisites:** AVBS3001 and AVBS4001 **Assessment:** 1000wd individual report (20%), 1000wd group assignment (20%), 2-hour exam (50%), MCQ (10%) **Practical field work:** Two field trips (compulsory) 16 hours total **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study focuses on the issues and practices in the animal industry relevant to food safety and zoonotic disease. This unit will cover general food safety issues, including risk assessment and hazard analysis of microbes and chemicals. Food-borne diseases of animal origin and their impact on public heath will be explored through the examination of zoonotic diseases in scenario-based learning activities. In these processes diagnostic and strategic methods of investigating, controlling and preventing food-borne disease outbreaks will be explored. Students will be introduced to national and international animal and human health policy pertaining to food safety regulations and surveillance initiatives and strategies that underpin these policies. Students in this unit will be introduced to the issues regarding emerging food-borne pathogens and current industry driven topics. By the end of the unit, students should have global and local perspective on the major food-borne diseases, surveillance and control programs. This unit is located at the Camden Campus.

Textbooks

Torrence ME and Isaacson RE (eds) 2003, Microbial food safety in animal agriculture current topics, Iowa State Press, Ames, Iowa

D'Mello JPF (ed.) 2003, Food safety: contaminants and toxins, CABI Publishing, Wallingford

Bucic S 2006, Integrated food safety and veterinary public health, CABI Publishing, Wallingford

Jay JM, Loessner MJ, Golden DA 2005, Modern Food Microbiology, 7th edn, Springer, New York

Colville J, Berryhill, D 2007, Handbook of Zoonoses - Identification and Prevention, Elsevier Mosby, St.Louis, MO USA

Table 3: Animal Production Systems Major

Comprises 30 credit points:

ANSC3101
Animal Nutrition 3

Credit points: 6 **Teacher/Coordinator:** A/Prof Alex Chaves **Session:** Semester 2 **Classes:** Lectures 2-3 hours per week, lecture recording 1-2 hours per week and in situ and/or online laboratories 2-3 hours per week **Prerequisites:** AVBS2001 and [VETS1032 or AGEN2001 or (MICR2X31 or MICR2024)] **Corequisites:** AVBS2001 and MICR2X31 **Assumed knowledge:** Fundamentals of Biochemistry **Assessment:** Three individual problem based-learning (PBL) reports (total of 50%), one video presentation (15%), individual PBL creation (15%), and one online end of term exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The Unit is broadly divided into four sections, namely: estimating the nutritive characteristics of feeds; defining the nutrient requirements of animals; diet formulation; errors in feeding. The focus is on coming to an understanding of the assessment of nutritional adequacy and the avoidance and solving of nutritional problems, with a particular emphasis on animals used in agricultural production systems and wildlife. The principles discussed in this course will be expanded in the following year, in which species-specific systems will be described. The basis of successful feeding management is an understanding of the following: the composition of feeds; the digestibility and efficiency of utilisation of nutrients by the animal; the nutrient requirements of the animal; interactions between nutrients that influence health and production. And following from this, students will have the ability to formulate diets to meet animal requirements for a variety of purposes and under a variety of constraints; identify deficiencies, excesses and imbalances in diets and so avoid a decline in productive efficiency and/or a decline in health.

Textbooks

Students are encouraged to have an individual tablet PC or laptop with wireless connectivity (e.g.: ipad; Galaxy Note, etc.) during all classes. There is no required text for the course. There will be a number of recommended readings advocated to students in the Unit of Study outline.

ANSC3102
Animal Reproduction

Credit points: 6 **Teacher/Coordinator:** A/Prof Simon de Graaf **Session:** Semester 1 **Classes:** Lectures 2 hours per week, tutorials 1 hour per week, practicals 3 hours per week **Assumed knowledge:** ANSC3104 **Assessment:** Written and oral assignments (30%), mid-semester practical exam (15%), end of semester written exam (55%) **Practical field work:** There will be several half day practical classes held at the Camden Campus **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a comprehensive programme on basic and applied aspects of male and female reproductive biology, with particular emphasis on livestock and domestic animals. The fundamental topics include reproductive cycles, sexual differentiation, gametogenesis, fertilization, embryo development, gestation and parturition. An understanding of the applications of advanced reproductive technologies is developed through lectures, tutorials and the assignments. In addition, practical instruction is given on semen collection and processing, manipulation of the reproductive cycle, artificial insemination, and pregnancy diagnosis in sheep and pigs. Classes are held at the Camperdown Campus in Sydney and at the Camden Campus Animal Reproduction Unit and Mayfarm piggery.

Textbooks

Senger, PL 2013, Pathways to pregnancy and parturition 3rd ed., Current Conceptions Inc

ANSC3105
Animal Biotechnology

Credit points: 6 **Teacher/Coordinator:** Assoc. Prof. Peter Williamson **Session:** Semester 2 **Classes:** Lectures 3 hours per week, tutorials 1 hour per week, practicals 2-3 hours for seven weeks **Assessment:** Practicals and quizzes (30%), essay and seminars (30%), exam (40%) **Practical field work:** laboratory practical classes **Mode of delivery:** Normal (lecture/lab/tutorial) day

Lectures, tutorials, laboratories, seminars and supervised reading and directed learning instruction will cover the application of biotechnology to animal health, animal production and veterinary biosciences. The course is organised around modules that consider the methodologies, ethical and technical issues in application veterinary regenerative technology (gene therapy; stem cell therapy), transgenic technologies, antibody and antigen receptor engineering, molecular diagnostics, and mining molecular bioactives, all discussed in contexts relevant to domestic animals. The course also integrates an introduction to the emerging field of animal biosystems, which covers the application of big data in animal biotechnology.

ANSC3106
Animal Behaviour and Welfare Science 3

Credit points: 6 **Teacher/Coordinator:** Dr Greg Cronin **Session:** Semester 2 **Classes:** 6 hours per week (including lectures, demonstrations, discussions and practical activities); classes will be held at the Camden campus **Prerequisites:** AVBS1002 **Assessment:** Assignments/presentations (50%), theory exam (50%) **Practical field work:** Practical class activities will be held at the May Farm pig unit and Camden poultry research unit, and there will be a full day excursion to Symbio Wildlife Zoo **Mode of delivery:** Normal (lecture/lab/tutorial) day

In Animal Behaviour and Welfare Science 3, the behavioural and physiological responses of mammals, birds and fish to stressors related to husbandry, housing, transport and slaughter are explored in some detail. This Unit enables students to develop an appreciation of the responses of animals to common interventions that arise in the context of interacting with humans, including the domestication of livestock species and the management of wildlife. The principles of animal responses to stress are illustrated with production species as the main examples. Contemporary approaches to the scientific measurement of animal stress and welfare, based on an appropriate selection of scientific disciplines including ethology, psychology, physiology and neuroscience, are assessed with an emphasis on farmed livestock species. Genetic, environmental and evolutionary determinants of pain, stress and fear responses in animals are considered in the light of what is known about cognition and motivation in animals. Methods for assessing and enhancing animal environments and husbandry systems are examined and the impact on animal behaviour and welfare of stockmanship is explored in the context of human-animal interactions. Finally, the design and conduct of scientific experiments are assessed with a focus on animal ethics and current welfare issues.

Textbooks

Broom, DM and Fraser, AF 2007, Domestic animal behaviour and welfare, 4th edition, CAB International, Cambridge Uni Press, Cambridge
A Unit of Study outline containing details of lecture outlines, objectives, reference lists, details of practical classes, staffing as well as other relevant class material will be available for students

ANSC3107
Animal Genetics 3

Credit points: 6 **Teacher/Coordinator:** Prof Claire Wade **Session:** Semester 2 **Classes:** 2 hours of classes per week where there are no on-line modules, 2 hours per week of practicals. Up to eight weeks of semester will be conducted as on-line learning modules. Students requiring extra assistance are encouraged to make an appointment with Prof Wade. **Prerequisites:** GENE2001 or GENE2002 or GEGE2X01 or MBLG2X72 **Assessment:** Practicals with associated reports and on-line quizzes (25%), mid-semester on-line examination (25%), final examination (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Genetics ANSC3107 is an exciting course that explores the technologies used by geneticists in practical situations involving domestic animals. We will expand on concepts learned in GENE2001 to learn more about genome sequencing, variant discovery, phylogenomics, bioinformatics, epigenetics, association mapping, gene therapy and forensic genetics.

Textbooks

There is no prescribed text for this subject.

Table 4: Wildlife Conservation and Management Major

Comprises 24 credit points, of which AVBS3003 and BIOL3007 are compulsory.

AVBS3003
Wildlife Management

Credit points: 6 **Teacher/Coordinator:** Dr Catherine Herbert **Session:** Semester 1 **Classes:** Lectures 3 hours per week, tutorials 2 hours per week on average (consult timetable) **Prerequisites:** 24 credit points from second year core units of study **Assumed knowledge:** All core Units of Study in Year 1 and 2 of BAnVetBioSc degree **Assessment:** Group assignment (20%), individual assignments and tutorial participation (40%), final exam (40%) **Practical field work:** Up to two days of field excursions **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study describes and evaluates key contemporary challenges faced by wildlife management professionals and conservation biologists. A key component of the course is to give students an appreciation of different stakeholder perspectives in wildlife management and how rigorous scientific method can be used to inform wildlife management decisions, using contemporary examples. This unit of study also explores the techniques and methods for undertaking wildlife research, with an emphasis on terrestrial vertebrate species. On completion of this unit, students will have experience in articulating and acknowledging various stakeholder views, both orally and in written form, and understand the processes involved in formulating an evidence-based management approach to contentious wildlife management scenarios.

Textbooks

Students should consult lecturers for recommended reading

BIOL3007
Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3907 **Assessment:** One 2-hour exam, group presentations, one essay, one project report (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the dynamics of ecological systems, and considers the interactions between individual organisms and populations, organisms and the environment, and ecological processes. Lectures are grouped around four dominant themes: Interactions, Evolutionary Ecology, The Nature of Communities, and Conservation and Management. Emphasis is placed throughout on the importance of quantitative methods in ecology, including sound planning and experimental designs, and on the role of ecological science in the conservation, management, exploitation and control of populations. Relevant case studies and examples of ecological processes are drawn from marine, freshwater and terrestrial systems, with plants, animals, fungi and other life forms considered as required. Students will have some opportunity to undertake short term ecological projects, and to take part in discussions of important and emerging ideas in the ecological literature.

Textbooks

Begon M, Townsend CR, Harper JL (2005) Ecology, From individuals to ecosystems. Wiley-Blackwell.

and at least two of the following:

ANSC3101
Animal Nutrition 3

Credit points: 6 **Teacher/Coordinator:** A/Prof Alex Chaves **Session:** Semester 2 **Classes:** Lectures 2-3 hours per week, lecture recording 1-2 hours per week and in situ and/or online laboratories 2-3 hours per week **Prerequisites:** AVBS2001 and [VETS1032 or AGEN2001 or (MICR2X31 or MICR2024)] **Corequisites:** AVBS2001 and MICR2X31 **Assumed knowledge:** Fundamentals of Biochemistry **Assessment:** Three individual problem based-learning (PBL) reports (total of 50%), one video presentation (15%), individual PBL creation (15%), and one online end of term exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The Unit is broadly divided into four sections, namely: estimating the nutritive characteristics of feeds; defining the nutrient requirements of animals; diet formulation; errors in feeding. The focus is on coming to an understanding of the assessment of nutritional adequacy and the avoidance and solving of nutritional problems, with a particular emphasis on animals used in agricultural production systems and wildlife. The principles discussed in this course will be expanded in the following year, in which species-specific systems will be described. The basis of successful feeding management is an understanding of the following: the composition of feeds; the digestibility and efficiency of utilisation of nutrients by the animal; the nutrient requirements of the animal; interactions between nutrients that influence health and production. And following from this, students will have the ability to formulate diets to meet animal requirements for a variety of purposes and under a variety of constraints; identify deficiencies, excesses and imbalances in diets and so avoid a decline in productive efficiency and/or a decline in health.

Textbooks

Students are encouraged to have an individual tablet PC or laptop with wireless connectivity (e.g.: ipad; Galaxy Note, etc.) during all classes. There is no required text for the course. There will be a number of recommended readings advocated to students in the Unit of Study outline.

ANSC3102
Animal Reproduction

Credit points: 6 **Teacher/Coordinator:** A/Prof Simon de Graaf **Session:** Semester 1 **Classes:** Lectures 2 hours per week, tutorials 1 hour per week, practicals 3 hours per week **Assumed knowledge:** ANSC3104 **Assessment:** Written and oral assignments (30%), mid-semester practical exam (15%), end of semester written exam (55%) **Practical field work:** There will be several half day practical classes held at the Camden Campus **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a comprehensive programme on basic and applied aspects of male and female reproductive biology, with particular emphasis on livestock and domestic animals. The fundamental topics include reproductive cycles, sexual differentiation, gametogenesis, fertilization, embryo development, gestation and parturition. An understanding of the applications of advanced reproductive technologies is developed through lectures, tutorials and the assignments. In addition, practical instruction is given on semen collection and processing, manipulation of the reproductive cycle, artificial insemination, and pregnancy diagnosis in sheep and pigs. Classes are held at the Camperdown Campus in Sydney and at the Camden Campus Animal Reproduction Unit and Mayfarm piggery.

Textbooks

Senger, PL 2013, Pathways to pregnancy and parturition 3rd ed., Current Conceptions Inc

ANSC3106
Animal Behaviour and Welfare Science 3

Credit points: 6 **Teacher/Coordinator:** Dr Greg Cronin **Session:** Semester 2 **Classes:** 6 hours per week (including lectures, demonstrations, discussions and practical activities); classes will be held at the Camden campus **Prerequisites:** AVBS1002 **Assessment:** Assignments/presentations (50%), theory exam (50%) **Practical field work:** Practical class activities will be held at the May Farm pig unit and Camden poultry research unit, and there will be a full day excursion to Symbio Wildlife Zoo **Mode of delivery:** Normal (lecture/lab/tutorial) day

In Animal Behaviour and Welfare Science 3, the behavioural and physiological responses of mammals, birds and fish to stressors related to husbandry, housing, transport and slaughter are explored in some detail. This Unit enables students to develop an appreciation of the responses of animals to common interventions that arise in the context of interacting with humans, including the domestication of livestock species and the management of wildlife. The principles of animal responses to stress are illustrated with production species as the main examples. Contemporary approaches to the scientific measurement of animal stress and welfare, based on an appropriate selection of scientific disciplines including ethology, psychology, physiology and neuroscience, are assessed with an emphasis on farmed livestock species. Genetic, environmental and evolutionary determinants of pain, stress and fear responses in animals are considered in the light of what is known about cognition and motivation in animals. Methods for assessing and enhancing animal environments and husbandry systems are examined and the impact on animal behaviour and welfare of stockmanship is explored in the context of human-animal interactions. Finally, the design and conduct of scientific experiments are assessed with a focus on animal ethics and current welfare issues.

Textbooks

Broom, DM and Fraser, AF 2007, Domestic animal behaviour and welfare, 4th edition, CAB International, Cambridge Uni Press, Cambridge

A Unit of Study outline containing details of lecture outlines, objectives, reference lists, details of practical classes, staffing as well as other relevant class material will be available for students

ANSC3107
Animal Genetics 3

Credit points: 6 **Teacher/Coordinator:** Prof Claire Wade **Session:** Semester 2 **Classes:** 2 hours of classes per week where there are no on-line modules, 2 hours per week of practicals. Up to eight weeks of semester will be conducted as on-line learning modules. Students requiring extra assistance are encouraged to make an appointment with Prof Wade. **Prerequisites:** GENE2001 or GENE2002 or GEGE2X01 or MBLG2X72 **Assessment:** Practicals with associated reports and on-line quizzes (25%), mid-semester on-line examination (25%), final examination (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Genetics ANSC3107 is an exciting course that explores the technologies used by geneticists in practical situations involving domestic animals. We will expand on concepts learned in GENE2001 to learn more about genome sequencing, variant discovery, phylogenomics, bioinformatics, epigenetics, association mapping, gene therapy and forensic genetics.

Textbooks

There is no prescribed text for this subject.

AVBS3001
Agents of Disease

Credit points: 6 **Teacher/Coordinator:** Dr Gary Muscatello **Session:** Semester 1 **Classes:** lectures 3 hours per week, laboratories/tutorials 2 hours per week, group work 1 hour per week **Prerequisites:** AVBS2001 **Assumed knowledge:** Animal and Veterinary Bioscience years 1-2 **Assessment:** 1500wd individual review (25%), 1000wd scenario-based group assignment (15%), 2 hour exam (50%), MCQ (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to examine and appreciate the diversity of various disease causing agents (microbiological and parasitological) of significance to animal industries and the various strategies employed by those agents in the host-pathogen-environment interaction. This study is based on an understanding of the physical, chemical and genetic characteristics of infectious agents of disease and builds on the pathological and immunological processes taught in AVBS2001 Introductory Veterinary Pathogenesis. A scenario/case based approach will be used whenever possible to enable the students to develop problem solving approaches and skills in critical thinking. Cases selected will be those that best illustrate particular concepts and/or are of particular significance to the animal/veterinary industry. Research and industry focus activities will infuse the subject content and student learning outcomes of this unit. This unit is located at the Camperdown campus.

Textbooks

A Unit of Study outline and LMS will contain detailed information and notes for this unit.

Recommended textbooks: Quinn PJ, Markey BK, Carter ME, Donnelly WJ and Leonard FC, 2011, Veterinary Microbiology and Microbial Disease. Blackwell Science, Oxford

Songer JG and Post KW, 2005, Veterinary Microbiology: Bacterial and Fungal Agents of Animal Disease. Saunders, St Louis

Hirsh DC, MacLachlan NJ and Walker RL, 2004, Veterinary Microbiology, Blackwell Science, Oxford

AVBS4003
Wildlife and Evolutionary Genetics

Credit points: 6 **Teacher/Coordinator:** A/Prof Jaime Gongora **Session:** Semester 2 **Classes:** On average 6 hours per week of lectures, tutorials, computer simulations and practical classes. This unit will be taught at the Camperdown campus **Assessment:** Written and oral assignment (30%), practical reports/class contribution (20%), final written exam (50%) **Practical field work:** Laboratory practicals, bioinformatic analyses and fieldtrip to a park in the Sydney or NSW areas **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study focuses on the role and animal and veterinary biosciences in the field of wildlife management management and diseases using project-based, open learning space and research-led teaching approaches. The unit encourages an approach that spans management, wildlife biology and laboratory sciences. In recognition of the power of genetics as a tool in wildlife management and research, a large component of this course reviews fundamental genetic, genomic and immunogenetic principals and their application to understanding, managing and conserving wildlife. This unit also covers themes in Indigenous knowledges related to animal management and conservation as well as cultural competence. At the end of this unit of study, students will demonstrate an understanding of: important issues in wildlife management in Australia and the Asia-pacific region; project management as it applies to multifaceted wildlife research and management issues; application of a range of genetic and physiological methods to the study of ecological issues; the use of appropriate analytical methods and molecular markers in wildlife conservation and management; the underlying genetic structural design of the natural world and how this reflects and influences evolutionary processes in healthy and diseased populations; the use of molecular information to test hypotheses about evolutionary, ecological and social structure of species; how to critically review the ways in which genetic principals are applied to the management and conservation of species; the use of appropriate analytical methods and molecular markers in wildlife conservation and management; how to conduct an investigation into a management problem in wildlife including project design and management recommendations. Students are expected to immerse themselves into the field of conservation, evolutionary genetics and wildlife to develop the ability to critically evaluate the subject. There will be a substantial amount of reading required for the course. There is no formal text; students will be directed to a recommended reading list of both primary and secondary literature.

Textbooks

Readings to be advised in the Unit of Study outline.

Bachelor of Food and Agribusiness

Bachelor of Food and Agribusiness

Bachelor of Food and Agribusiness (Honours)

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BUFDAGBU-01	Bachelor of Food and Agribusiness

2 Attendance pattern

The attendance pattern for this course is full time or part time according to candidate choice.

3 Admission to candidature

Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents), tertiary study or an approved preparation program. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for mature aged applicants who do not possess a school leaving qualification, educationally disadvantaged applicants and for Aboriginal and Torres Strait Islander people. Applicants are ranked by merit and offers for available places are issued according to the ranking. Details of admission policies are found in the Coursework Rule.

4 Requirements for award

(1) The units of study that may be taken for the course are set out in the tables of units of study for the Bachelor of Food and Agribusiness. The Dean may approve some variation in units of study required for the degree for exceptionally talented students.

(2) To qualify for the award of the pass degree, a candidate must successfully complete 192 credit points, including:

(a) 150 credit points of core units of study listed in Tables 1A and 1B including an internship (12 credit points) and a research project (24 credit points); and

(b) 42 credit points of electives units of study as listed in Tables FA1 and FA2 in Years 3 and 4.

(3) A maximum of 12 credit points in Year 4 may be taken from units outside of the Table (including from other faculties), to count as Year 4 electives.

(4) To qualify for the award of international specialisation, a candidate must complete a minimum of 48 credit points in approved units of study for two semesters at an approved university. Once a student has applied for and been accepted for International Exchange, the student may then apply for the International Specialisation. For detailed information on the application procedure, requirements and approved universities, please see the Student Centre.

5 Majors

(1) It is a requirement of the course that all students complete the following majors:

(a) Agribusiness; and

(b) Food Science

(2) Outside of the internship (12 credit points) and the research project (24 credit points), students will complete 66 credit points comprising 48 credit points of core units listed in Table 1A and 18 credit points of elective units listed in Table FA1 to achieve a major in Agribusiness and 66 credit points of core units of study listed in Table 1B to achieve a major in Food Science.

6 Award of the degree

(1) The Bachelor of Food and Agribusiness is awarded as either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Second Class according to the conditions specified in 7.2.

(2) Candidates who do not meet the requirements for the award of the Honours degree, but who have otherwise satisfied the course requirements, will be awarded the pass degree.

7 Award of the degree of Bachelor with Honours

(1) To qualify for the award of honours a candidate must have:

(a) achieved an average mark (AM) of at least 65 for 2000 and 3000 level units of study completed in years 2 and 3 of the degree (as defined below), and;

(b) completed an independent research component as part of the final year of the program and achieved an overall honours mark of at least 65.

(2) For the Bachelor of Food and Agribusiness, the Faculty of Agriculture and Environment uses Year 2/3 AM that normally includes all 2000 level and 3000 level units of study, except those units of study taken to fulfill part of the requirements for Year 4. The Year 4 AM includes all3000 level and 4000 level units of study, and a maximum of two 2000 level units of study, taken to fulfill part of the requirements for Year 4.

(3) The overall honours mark will be the average of the Year 2/3 AM and the Year 4 AM, as defined in 7(2). Research project units will have a weighting of two and all other units will have a weighting of one.

(4) Honours is awarded in the following classes:

Class of honours	Overall honours mark	Minimum AM Years 2/3
First Class	mark >= 75	65
Second Class, Division 1	70 <= mark < 75	65
Second Class, Division 2	65 <= mark < 70	65
Honours not awarded	mark <65	n/a

Bachelor of Food and Agribusiness

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
All students complete an Agribusiness major and a Food Science major.			
Year 1			
Year 1 will have a minimum of 48 credit points comprised of:			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
or			
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
or			
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BUSS1000 **Future of Business** BUSS1000 is scheduled for Semester 1	6	**N** BUSS1001	Semester 1 Semester 2
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
or			
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
or			
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
AGEC1006 **Economic Environment of Agriculture**	6	**A** HSC Mathematics **N** AGEC1003 or AGEC1004	Semester 2
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
or			
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
or			
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
CHEM1012 **Fundamentals of Chemistry 1B**	6	**P** CHEM1XX1 **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992	Semester 2
or			
CHEM1112 **Chemistry 1B**	6	**P** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM1112 is scheduled for Semester 2			
or			
CHEM1912 **Chemistry 1B (Advanced)**	6	**P** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 *Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.*	Semester 2
ENVI1003 **Global Challenges: Food, Water, Climate**	6		Semester 2
Year 2			
Year 2 will have a minimum of 48 credit points comprised of:			
MKTG1001 **Marketing Principles**	6		Semester 1 Semester 2
MKTG1001 is scheduled for Semester 1			
AGEN2001 **Plant Function**	6	**P** 6cp from (BIOL1XXX or AGEN1004) and 12cp from (CHEM1XX1 or CHEM1XX2 or AGEN1006) **N** PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906	Semester 1
AGEN2002 **Fresh Produce Management**	6	**A** HSC level Mathematics and Biology and CHEM1XX1 or CHEM1XX2 or CHEM1903 or CHEM1904 **P** 6cp from (BIOL1XXX or AGEN1004 or MBLG1XX1)	Semester 1
BUSS1030 **Accounting, Business and Society**	6	**N** ACCT1001 or ACCT1002 or ACCT1003 or ACCT1004 or ACCT1005	Semester 1 Semester 2
BUSS1030 is scheduled for Semester 2			
ITLS2000 **Managing Food and Beverage Supply Chains**	6	**N** AGEN2003 or AGEN1005	Semester 2
AGEN2006 **Animal Production and Management**	6	**A** HSC level Mathematics and Biology **P** 12cp from (BIOL1XXX, AGEN1004) and 12cp from (CHEM1XX1, CHEM1XX2, AGEN1006) **N** AVBS1002	Semester 2
MICR2031 **Microbiology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **N** MICR2021 or MICR2921 or MICR2024 or MICR2931	Semester 1
or			
MICR2931 **Microbiology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **P** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2021 or MICR2921 or MICR2024 or MICR2031	Semester 1
And one elective unit from Table FA1.			
Year 3			
Year 3 will have a minimum of 48 credit points comprised of:			
AGCH3025 **Chemistry and Biochemistry of Foods**	6	**A** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **N** AFNR5102 or AGCH3017 or AGCH3024	Semester 1
AGEN3004 **Food Processing and Value Adding**	6	**P** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX)	Semester 1
And two elective units from Table FA1.			
AGEN3001 **Food Product Development**	6	**A** 6cp from (BIOL1XXX, MBLG1XXX) and 6cp from CHEM1XXX **P** 6cp from AGEN3004	Intensive August
AGEN3003 **Global Food and Nutrition Security**	6	**A** 48 Credit Points of Junior and Intermediate units. **P** AGEN2002 and AGEN2003 and AGEN2006	Intensive August
The units of study AGEN3001 Food Product Development and AGEN3003 Global Food and Nutrition Security will be delivered in intensive mode at the beginning of second semester prior to AGEN3002 Industry Internship.			
AGEN3002 **Industry Internship**	12	**P** A minimum of 96cp from Year 1 and Year 2 units or on Faculty approval. *Note: Department permission required for enrolment* *Costs: students to cover internship related costs (e.g. travel, accommodation) where required*	Semester 2
Year 4			
Year 4 will have a minimum of 48 credit points comprised of:			
AFNR4101 **Research Project A**	12	**P** 144 credit points of level 1000-3000 units of study	Semester 1
and 12 credit points of electives from Table FA1 and FA2.			
AFNR4102 **Research Project B**	12	**P** AFNR4101	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
and 12 credit points of electives from Table FA1 and FA2.			

Elective unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Table FA1			
School of Economics units			
AREC2001 **Econ of Biological Production Systems**	6	**P** ECON1001 or AGEC1006 or AGEC1102	Semester 1
AREC2002 **Commodity Market and Price Analysis**	6	**P** ECON1001 or AGEC1006 or AGEC1102	Semester 2
AREC3001 **Production Modelling and Management**	6	**P** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901	Semester 2
AREC3002 **Agricultural Markets**	6	**P** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901	Semester 2
AREC3005 **Agricultural Finance and Risk**	6	**P** AREC2001 or AGEC2103 or AREC2002 or AGEC2101 or ECOS2001 or ECOS2901	Semester 1
See Faculty of Arts and Social Sciences (Undergraduate) Handbook			
Business School units			
Students may take units of study from the following subject areas in the Business School: Accounting; Business Analytics; Banking; Business Information Systems; Commercial Law; Finance; Industrial Relations and Human Resources Management; International Business; Management; Marketing			
Notes: Prerequisites and/or co-requisites apply for most units. See the Business School (Undergraduate) Handbook			

Table FA2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Table FA2			
Students may only select two 2000 level units of study from Tables FA1 and FA2 to fulfil part of the requirements for Year 4.			
AFNR3001 **Agro-ecosystems in Developing Countries**	6	*Note: Department permission required for enrolment*	Semester 1
AFNR5107 **Principles of Biochemical Analysis**	6	**N** AGCH4007	Semester 1
AGEN3005 **Flavour and Sensory Analysis**	6	**A** Knowledge of statistics from, or equivalent to that in, the 1st year Units of Study in the degrees in which this Unit is available. **P** 12cp from (CHEM1XX1, CHEM1XX2, AGEN1006)	Semester 1
AGEN3008 **Indigenous Land and Food Knowledge**	6	*Note: Department permission required for enrolment* *Students must attend pre-trip briefing session (one day in S1 exam period), field trip (approximately two weeks in mid-year break) and post-trip workshop (one day in S2).*	Semester 2
AGEN5001 **Agricultural and Environmental Extension**	6		Semester 1
AVBS4002 **Dairy Production and Technology**	6	**A** Enrolled students are expected to have some understanding of key components of the dairy production system, including basic knowledge of animal physiology and nutrition.	Semester 2
AVBS4004 **Food Safety Assessment and Management**	6	**P** AVBS3001 and AVBS4001	Semester 2
AVBS4008 **Intensive Animal Industries**	6	**P** (Animal and Veterinary Bioscience years 1-3) OR (Bachelor of Science in Agriculture years 1-3)	Semester 2
AVBS4012 **Extensive Animal Industries**	6	**P** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3	Semester 1
ENVX2001 **Applied Statistical Methods**	6	**P** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
HORT3005 **Production Horticulture**	6	**P** (AGEN2001 and AGEN2005) or BIOL2X30 or BIOL2X31 or BIOL2X23 or AGEN2002 or AGRI2001	Semester 1
HORT4005 **Research and Practice in Horticulture**	6	**P** HORT3005	Semester 2
PHYS5031 **Ecological Econ and Sustainable Analysis**	6		Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PHYS5033 **Environmental Footprints and IO Analysis**	6	*Minimum class size of 5 students.*	Semester 1 Semester 2
PHYS5034 **Life Cycle Analysis**	6	*Minimum class size of 5 students.*	Semester 2

Table 1A and Table 1B

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
All students complete an Agribusiness Major and a Food Science Major			
Table 1A - Agribusiness Major			
Year 1			
BUSS1000 **Future of Business**	6	**N** BUSS1001	Semester 1 Semester 2
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
AGEC1006 **Economic Environment of Agriculture**	6	**A** HSC Mathematics **N** AGEC1003 or AGEC1004	Semester 2
ENVI1003 **Global Challenges: Food, Water, Climate**	6		Semester 2
Year 2 and 3 Units			
BUSS1030 **Accounting, Business and Society**	6	**N** ACCT1001 or ACCT1002 or ACCT1003 or ACCT1004 or ACCT1005	Semester 1 Semester 2
MKTG1001 **Marketing Principles**	6		Semester 1 Semester 2
ITLS2000 **Managing Food and Beverage Supply Chains**	6	**N** AGEN2003 or AGEN1005	Semester 2
AGEN3003 **Global Food and Nutrition Security**	6	**A** 48 Credit Points of Junior and Intermediate units. **P** AGEN2002 and AGEN2003 and AGEN2006	Intensive August
Students are also required to complete 18 credit points of elective units from Table FA1 for the Agribusiness Major.			
Table 1B - Food Science Major			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
or			
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
or			
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
or			
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
or			
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
or			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
or			
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
CHEM1012 **Fundamentals of Chemistry 1B**	6	**P** CHEM1XX1 **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992	Semester 2
or			
CHEM1112 **Chemistry 1B**	6	**P** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992	Semester 1 Semester 2
or			
CHEM1912 **Chemistry 1B (Advanced)**	6	**P** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 *Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.*	Semester 2
Year 2 and 3 units			
AGEN2001 **Plant Function**	6	**P** 6cp from (BIOL1XXX or AGEN1004) and 12cp from (CHEM1XX1 or CHEM1XX2 or AGEN1006) **N** PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906	Semester 1
AGEN2002 **Fresh Produce Management**	6	**A** HSC level Mathematics and Biology and CHEM1XX1 or CHEM1XX2 or CHEM1903 or CHEM1904 **P** 6cp from (BIOL1XXX or AGEN1004 or MBLG1XX1)	Semester 1
AGEN2006 **Animal Production and Management**	6	**A** HSC level Mathematics and Biology **P** 12cp from (BIOL1XXX, AGEN1004) and 12cp from (CHEM1XX1, CHEM1XX2, AGEN1006) **N** AVBS1002	Semester 2
MICR2031 **Microbiology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **N** MICR2021 or MICR2921 or MICR2024 or MICR2931	Semester 1
or			
MICR2931 **Microbiology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **P** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2021 or MICR2921 or MICR2024 or MICR2031	Semester 1
AGCH3025 **Chemistry and Biochemistry of Foods**	6	**A** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **N** AFNR5102 or AGCH3017 or AGCH3024	Semester 1
AGEN3001 **Food Product Development**	6	**A** 6cp from (BIOL1XXX, MBLG1XXX) and 6cp from CHEM1XXX **P** 6cp from AGEN3004	Intensive August
AGEN3004 **Food Processing and Value Adding**	6	**P** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX)	Semester 1

Bachelor of Food and Agribusiness

Unit of study descriptions

All students complete an Agribusiness major and a Food Science major.

Year 1

Year 1 will have a minimum of 48 credit points comprised of:

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

or

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

or

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks

Please see unit outline on LMS

Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BUSS1000
Future of Business

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 1.5 hour lecture every week (13), 1.5 hr tutorial each week, guided learning material (e.g. videos, podcasts, contemporary case studies etc.). 8x 1.5 hr workshops: Students who are identified as benefiting from additional academic support (a written diagnostic is administered during week 1 of the BUSS1000 tutorials) will be required to attend a 1.5 hour weekly workshop from Week 3 on Business Communication and Academic Writing (BCAC). **Prohibitions:** BUSS1001 **Assessment:** Case study (25%), team presentation (25%), tutorial attendance and participation (15%), final exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This compulsory first year unit is designed to provide commencing undergraduate students with insights into the study and the practice of business. Students gain foundational knowledge in relation to business stakeholders, business challenges and the ways in which business leaders might approach responding to these challenges. Key stakeholders within and external to organisations are identified and their interests are analysed. Critical business challenges such as climate change and sustainability, the future of work and workforce diversity are investigated. The way that these challenges affect different types of business, sectors and stakeholders is analysed and responses constructed to them. The unit is delivered in a blended format, with face-to-face lectures, seminars, and interactive online modules. Success in this unit is determined by strong application of critical, strategic and cross-disciplinary thinking, as well as the ability to demonstrate business knowledge and problem solving skills through effective written and oral communication.

BUSS1000 is scheduled for Semester 1

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

ENVX1002
Introduction to Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Thomas Bishop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour tutorial per week, one 2-hour computer practical per week **Prohibitions:** ENVX1001 **Assessment:** One exam during the exam period (50%), three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This is an introductory statistics unit for students in the agricultural, life and environmental sciences. It provides the foundation for statistics and data science skills that are needed for a career in science and for further study in applied statistics and data science. In the first portion of the unit the emphasis is on describing data using statistical and graphical summaries, and probability models. In the second part the focus is on formal hypothesis testing on experimental data using statistical tests. The final part of the unit is on finding patterns in biological and environmental data, through the use of linear and non-linear functions. In the practicals the emphasis is on applying theory to analysing real datasets using the spreadsheet package Excel and the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

AGEC1006
Economic Environment of Agriculture

Credit points: 6 **Session:** Semester 2 **Classes:** 2x1hr lectures/week, 1x1hr tutorial/week **Prohibitions:** AGEC1003 or AGEC1004 **Assumed knowledge:** HSC Mathematics **Assessment:** 1x2hr exam (55%) and 1x50 min mid-semester exam (25%) and workshop papers (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to give an understanding of some basic economic principles and to introduce the characteristics of the economic environment in which Australian agriculture operates. Topics to be covered include the structure, nature and history of the agricultural industries in Australia; agricultural adjustment in the world economy; introductory principles of production economics and farm management; elementary price theory and the factors affecting the demand, supply and prices of agricultural commodities.

Textbooks

HE Drummond and JW Goodwin, Agricultural Economics, 3rd edn (Prentice-Hall, 2011)

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

or

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

or

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

CHEM1012
Fundamentals of Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1XX1 **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Fundamentals of Chemistry 1B is built on a satisfactory prior knowledge of Fundamentals of Chemistry 1A. Compared to the mainstream Chemistry 1B, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit requires completion of an online supplementary course.

Textbooks
Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1112
Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2 **Classes:** 1x3-hr lecture; 1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviours, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do we develop lotions that don't burn us, how do we measure UV absorption by sunscreens, how can we measure and alter soil pH, how are sticky things made, and how do we determine the concentration of vitamin C in juice? Through enquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B is built on a satisfactory prior knowledge of Chemistry 1A.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1112 is scheduled for Semester 2or

CHEM1912

Chemistry 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B (Advanced) is built on a satisfactory prior knowledge of Chemistry 1A (Advanced). Compared to the mainstream Chemistry 1B, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

ENVI1003

Global Challenges: Food, Water, Climate

Credit points: 6 **Teacher/Coordinator:** A/Prof Stephen Cattle **Session:** Semester 2 **Classes:** Two lectures per week, 2hour tutorial/computer lab per week, two-day weekend field trip **Assessment:** One 2-hour exam (50%), field trip report (15%), tutorial presentation (20%), GIS reports (15%) **Practical field work:** Computer practicals and two day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

In the 21st century the population of the world will increase both in size and its expectation in terms of food, energy and consumer demands. Against this demand we have a planet in crisis where natural resources are degraded, biodiversity is diminishing and planetary cycles related to climate are reaching points of irreversible change. Management of our precious natural resources is a balancing act between production and conservation as always, but now we have to do this against a background of potential large scale changes in climate. In this unit students will gain an understanding of the key environmental challenges of the 21st century; namely food security, climate change, water security, biodiversity protection, ecosystems services and soil security. In the second half using Australian case studies we will explore how we manage different agro-ecosystems within their physical constraints around water, climate and soil, while considering linkages with the global environmental challenges. Management now, in the past and the future will be considered, with an emphasis on food production. This unit is recommended unit for students interested in gaining a broad overview of the environmental challenges of the 21st century, both globally and within Australia.

Year 2

Year 2 will have a minimum of 48 credit points comprised of:

MKTG1001

Marketing Principles

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 1x 2hr lecture and 1x 1hr tutorial per week **Assessment:** project (20%), presentation (15%), participation (7%), mid-semester exam (28%), final exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines the relationships among marketing organisations and final consumers in terms of production-distribution channels or value chains. It focuses on consumer responses to various marketing decisions (product mixes, price levels, distribution channels, promotions, etc.) made by private and public organisations to create, develop, defend, and sometimes eliminate, product markets. Emphasis is placed on identifying new ways of satisfying the needs and wants, and creating value for consumers. While this unit is heavily based on theory, practical application of the concepts to "real world" situations is also essential. Specific topics of study include: market segmentation strategies; market planning; product decisions; new product development; branding strategies; channels of distribution; promotion and advertising; pricing strategies; and customer database management.

MKTG1001 is scheduled for Semester 1

AGEN2001

Plant Function

Credit points: 6 **Teacher/Coordinator:** A/Prof Tina Bell (Coordinator), Dr Thomas Roberts **Session:** Semester 1 **Classes:** Two 1-hour lectures, One 3-hour practical per week **Prerequisites:** 6cp from (BIOL1XXX or AGEN1004) and 12cp from (CHEM1XX1 or CHEM1XX2 or AGEN1006) **Prohibitions:** PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906 **Assessment:** One 1-hour mid-semester exam (25%), one 1-hour final exam (25%), 1 x 1000wd essay (10%), four practical reports (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to develop an understanding of the structural and molecular principles that underlie the function of plants and how these principles relate to the use of plants by humans as sources of food, fibre and fuel.

The unit is a core unit for BScAgr students and an elective for BSc and other degree programs. It recognizes the specialized nature of plant anatomy and biochemistry and is a platform for students who wish to gain a sound knowledge of plant growth and development.

This unit covers the structure of plant cells and the anatomy of the major tissues and organs of plants. It also covers the biochemistry of the main carbohydrate, lipid, protein and nucleic acid constituents of plants, as well as the metabolic pathways that regulate plant growth and development.

At the completion of this unit students will be able to demonstrate theoretical knowledge of the structure and function of plants. Students will also be able to demonstrate abilities in the practice of laboratory methods used to analyse plants and the effective communication of experimental findings.

Students enrolled in this unit will gain research and enquiry skills through attendance at lectures and participation in laboratory classes and tutorials; information literacy and communication skills through the synthesis of information used to prepare practical reports; social and professional understanding by participation in group-work and assessments that seek to demonstrate the role of agriculture in the broader community.

Textbooks

Taiz L, Zeiger E (2010) Plant Physiology 5th ed.

AGEN2002
Fresh Produce Management

Credit points: 6 **Teacher/Coordinator:** Dr Rosalind Deaker **Session:** Semester 1 **Classes:** Two 1-hour lectures per week **Prerequisites:** 6cp from (BIOL1XXX or AGEN1004 or MBLG1XX1) **Assumed knowledge:** HSC level Mathematics and Biology and CHEM1XX1 or CHEM1XX2 or CHEM1903 or CHEM1904 **Assessment:** Three practical reports (15% each), one group presentation (15%), one end of semester exam (40%) **Practical field work:** Two field trips, six practical sessions per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers some fundamental concepts in food science with a particular emphasis on post-harvest management of fresh produce. Students will critically examine the science underpinning management and handling of fresh food products. The unit primarily addresses the challenges of maintaining quality, extending shelf life and improving safety of fresh perishable produce by examining relevant industrial practices and technologies.. Students will develop practical skills and integrate knowledge of physiology, technology and economics of fresh produce management to determine optimal storage and handling conditions for maximum quality, shelf life, safety and ultimately consumer experience. The majority of examples will be drawn from fruits and vegetables, dairy, eggs, meat and seafood products. Industry quality assurance schemes and government regulations will be examined, with particular reference to food safety. The students will gain research, inquiry and communication skills through a research-based group project, an oral presentation and laboratory reports. Personal and intellectual autonomy will be developed through group and individual work.

Textbooks

No prescribed textbooks

BUSS1030
Accounting, Business and Society

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 1x 1.5hr lecture and 1x 1.5hr tutorial per week **Prohibitions:** ACCT1001 or ACCT1002 or ACCT1003 or ACCT1004 or ACCT1005 **Assessment:** tutorial contribution (10%), assignment (15%), mid-semester examination (25%), final examination (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit investigates the fundamentals of accounting and aims to provide a broad understanding of the role of accounting in the context of business and society. The format of the unit is designed to show that there are many uses of accounting data. The focus moves from accountability to decision making; both functions are explained through examples such as the 'double entry equation', and from an output (financial statements) perspective. Some more technical aspects of accounting are outlined, including the elements of assets, liabilities, revenues and expenses within simple, familiar scenarios. Besides developing an understanding of the role of accounting via conventional financial reports, recent developments including the discharge of accountability by companies through the release of corporate social and environmental reports and the global financial crisis, are explored through an accounting lens.

BUSS1030 is scheduled for Semester 2

ITLS2000
Managing Food and Beverage Supply Chains

Credit points: 6 **Session:** Semester 2 **Classes:** 1 x 3 hr seminar/tutorial per week **Prohibitions:** AGEN2003 or AGEN1005 **Assessment:** tutorial quiz (10%), individual assignement (35%), group project report (15%), group project presentation (10%), final 2hr exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The food and beverage sector is one of the key economic activities in virtually all countries in the world today. When it comes to logistics and supply chain management within this sector, there is a level of complexity, not frequently found in other industries. This includes the need to consider products bulkiness, perishability and seasonality, coupled with potential additional infrastructure requirements in respect of temperature-controlled storage and transport. As a consequence, there is a higher imperative to have a well-designed end-to-end supply chain. Equally, it is important to understand issues from the perspectives of the various actors in food and beverage supply chains including farms, processing units, wholesalers / distributors, and retailers. Overarching the structuring of any food and beverage supply chain will be consideration of issues such as perishability, quality and risk. Further, for a supply chain to be effective and efficient consideration also needs to be given to the support functions of information management, use of technology, and financial reporting. In today's world, companies compete on supply chains. Those who have the ability to establish a distinctive supply chain and create it as a strategic asset will therefore emerge as industry leaders.

AGEN2006
Animal Production and Management

Credit points: 6 **Teacher/Coordinator:** A/Prof Luciano Gonzalez **Session:** Semester 2 **Classes:** Two 1-hour lectures per week **Prerequisites:** 12cp from (BIOL1XXX, AGEN1004) and 12cp from (CHEM1XX1, CHEM1XX2, AGEN1006) **Prohibitions:** AVBS1002 **Assumed knowledge:** HSC level Mathematics and Biology **Assessment:** One 2-hour final exam (50%), four online quizzes (20%), reflective statement (5%), handling and husbandry resource guide (20%), lectures and practicals attendance (5%) **Practical field work:** Six excursions/ practical sessions per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to develop the student's ability to critically examine and evaluate the production and management of animals used for food and fibre in Australia and internationally. The unit will focus on new and emerging issues in animal production, including productivity, welfare, remote monitoring and management, animals in the environment, and meeting specifications in an ever-evolving marketplace. The identification, selection and breeding of animals that are optimally suited to production systems is a focus. New thinking and innovations that are being used to address scientific, industry and social expectation challenges will be a feature of the unit and case studies will be used throughout to examine interactions between these factors and their impact on management practices. Students will gain research and inquiry skills through research based group projects, information literacy and communication skills through online discussion postings, laboratory reports and presentations, and personal and intellectual autonomy through working in groups. At the successful completion of the unit, students will have the core knowledge and skills to enable them to lead developments in production animal industries in Australia and overseas.

Textbooks

No prescribed textbooks

MICR2031

Microbiology

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2931 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45-minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: one written assignment (15%), one group oral presentation (10%) and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the earth's trees. This unit of study will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require if you specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology or science education.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

or

MICR2931

Microbiology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prerequisites:** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2031 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45 minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: two written assignments (10%, 15%), and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the Earth's trees. In this unit of study you will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Detailed aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require to specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology, or science education. As an Advanced unit, MICR2931 provides increased challenge and academic rigour to develop a greater understanding and depth of disciplinary expertise. You will actively participate in a series of small group tutorials investigating the molecular detail of microbial communication and function, which will culminate in you creating a scientific research report that communicates your understanding of recent research in microbiology.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

And one elective unit from Table FA1.

Year 3

Year 3 will have a minimum of 48 credit points comprised of:

AGCH3025

Chemistry and Biochemistry of Foods

Credit points: 6 **Teacher/Coordinator:** Dr Thomas Roberts (Coordinator), Prof Les Copeland **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 4-hour practical fortnightly **Prohibitions:** AFNR5102 or AGCH3017 or AGCH3024 **Assumed knowledge:** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **Assessment:** One 2-hour exam (40%) and six lab reports (6x10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to give students an understanding of the properties of food constituents, and the interactions between these constituents during food processing, storage and digestion. The unit will develop an understanding of the relationship between form and functionality of constituents and the concept of fitness-for-purpose (i.e., quality) in converting agricultural products into foods. Students will gain an appreciation of the relationship between chemical composition and properties of macroconstituents (carbohydrates, proteins, lipids) and microconstituents (vitamins, minerals, antioxidants, flavour and anti-nutritional chemicals) and their functions in plant- and animal-based foods. The material presented in lectures and practical classes will enable students to develop research and inquiry skills and an analytical approach in understanding the biochemistry of foods, food processing and storage. On completing this unit, students will be able to describe the chemical and biochemical properties of major food constituents, and demonstrate an understanding of the functionality of these constituents in food processing and nutrition. Students will have gained experience in laboratory techniques used in industry for the analysis of some food products, and information literacy and communication skills from the preparation of practical reports.

Textbooks

Lecture and laboratory notes will be made available through Blackboard. There is no recommended textbook.

AGEN3004

Food Processing and Value Adding

Credit points: 6 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien **Session:** Semester 1 **Classes:** Two 1-hour lectures per week **Prerequisites:** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX) **Assessment:** Two individual assignments (10% + 20%), one group processing report (20%), one group oral presentations (10%), one 2-hour final exam (40%) **Practical field work:** One 3-hour practical or excursion per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

From the grinding of grains to the drying of meats, humans have been processing their food since the dawn of civilisation. Over the decades, many traditional processing methods have become industrialised, while new processing technologies have emerged, quietly revolutionising our food systems, diets and cultures. In this unit of study, students examine the biochemical and physicochemical transformations that occur in food materials during processing and how processing parameters affect the fulfilment of food quality, shelf-life, and safety objectives. The unit is roughly organised into modules on (1) processing to modify food structure; (2) processing for preservation; and value-adding, focused on (3) healthier food and (4) fermentation as interesting case studies in food processing.The unit will include lectures, laboratory sessions, group work and visits to food processing facilities.

Textbooks

No prescribed textbooks

And two elective units from Table FA1.

AGEN3001

Food Product Development

Credit points: 6 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien **Session:** Intensive August **Classes:** Intensive Unit - twelve 4-hour workshops over four weeks **Prerequisites:** 6cp from AGEN3004 **Assumed knowledge:** 6cp from (BIOL1XXX, MBLG1XXX) and 6cp from CHEM1XXX **Assessment:** One individual assignment (20%), one group project report (60%), one group presentation (20%) **Practical field work:** Six practical sessions **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this unit of study, students will gain a theoretical and practical understanding of the development of novel food products using traditional and novel food ingredients. Students will examine processes in market trend analysis, product innovation, prototype development, product testing and the formal presentation of a new product. They will develop practical skills in product research and development through a group design project that will require application of product development principles and integration of knowledge regarding product specifications, ingredient interactions and food processing. Product quality, functionality, shelf-life, safety, nutritional and health implications are key considerations in the design process. This is an intensive unit taught as a series of workshops over the first four weeks of semester. It is designed to be taken as one of the final core units in the food science major of the BFoodAgrib as it integrates learnings from across the program and offers a great platform for exploration of product development ideas, that could potentially be expanded in 4th year research projects.

Textbooks

No prescribed textbooks

AGEN3003

Global Food and Nutrition Security

Credit points: 6 **Teacher/Coordinator:** A/Prof Brian Jones (Coordinator), Academics from a range of Schools and Faculties will present material in this unit. **Session:** Intensive August **Classes:** Intensive Unit - Weeks 1-4, 15 contact hours per week (lectures, workshops and tutorial sessions) **Prerequisites:** AGEN2002 and AGEN2003 and AGEN2006 **Assumed knowledge:** 48 Credit Points of Junior and Intermediate units. **Assessment:** One group presentation (60%), one individual assignment (30%), one viva voce (10%). **Practical field work:** Six excursions/practical sessions over four weeks (weeks 1 - 4) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Humanity has made great progress towards a food secure world over the past several decades. Continuing this progress in a world where environmental constraints are becoming increasingly obvious is the next great challenge. The shortfalls in global food security are manifested in particular by the triple burden of malnutrition/undernutrition, micronutrient deficiencies, and obesity. In this unit, students will explore state-of-the-art research, analysis, and global visions for a food secure planet from a wide range of perspectives, including technological, biophysical, behavioural, economic, institutional, political, and social. The course ranges across disciplines and spatiotemporal scales to examine the synergies and trade-offs between human health, social, environmental, and economic objectives and outcomes. Case studies will be used throughout the unit. Students will gain research and inquiry skills through a major research-based project. At the successful completion of the unit, students will have the core knowledge and skills to enable them to critically analyse policy, development and research goals and settings and their impact on global and regional food security.

Textbooks

No prescribed textbooks

The units of study AGEN3001 Food Product Development and AGEN3003 Global Food and Nutrition Security will be delivered in intensive mode at the beginning of second semester prior to AGEN3002 Industry Internship.

AGEN3002

Industry Internship

Credit points: 12 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien (Coordinator), A/Prof Brian Jones, Dr Maria Taranto (Internship Placement Coordinator) **Session:** Semester 2 **Classes:** One 12-week industry internship **Prerequisites:** A minimum of 96cp from Year 1 and Year 2 units or on Faculty approval. **Assessment:** One faculty excursion report (10%), professional conduct and engagement (10%), one industry report (20%), one reflective diary (20%), one internship report (35%), one oral presentation (5%) **Mode of delivery:** Professional practice

Note: Department permission required for enrolment. Note: Costs: students to cover internship related costs (e.g. travel, accommodation) where required

This unit of study is designed as a Work-Integrated Learning industry placement in the agri-food sector where students will consolidate and contextualise the knowledge and skills in applied science and business they have gained in Years 1-3 of the degree. Businesses and organisations that have agreed to host interns include small-medium enterprises (SMEs), large national and multinational companies; and government and non-government organisations with roles in the production, processing, distribution, marketing, research and development, policy-making or regulation of agri-food products. Students will further their learning through application of scientific and business concepts in an authentic practical setting, which will be selected where possible to align with their interests and career aspirations. Internships are established by the Food and Agribusiness Internship Coordinator in consultation with students and host organisations. Student learning outcomes will be achieved in several ways. First, pre-placement workshops on 'soft skills' including inter-personal, communication and self-management skills will improve work-readiness and build student confidence. Throughout the industry placement, students will be offered mentoring by an assigned academic mentor through regular communication and a site visit during the 3rd week of placement. Finally, the assessment tasks have been designed to ensure that the internship is accompanied by continued development of research skills, reflective practice, critical thinking, analytical perspectives, reporting and presentation skills.

Textbooks

No prescribed textbooks for unit, however students are expected to undertake reading of relevant industry and academic literature for background information.

Year 4

Year 4 will have a minimum of 48 credit points comprised of:

AFNR4101
Research Project A

Credit points: 12 **Teacher/Coordinator:** Prof Budiman Minasny **Session:** Semester 1 **Classes:** No formal classes, approximately 18 hours per week **Prerequisites:** 144 credit points of level 1000-3000 units of study **Assessment:** Research proposal, literature review. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to develop a student's ability to undertake a major research project in an area of specialization. The unit builds on theoretical and applied knowledge gained across most of the units of study undertaken throughout their degree program. This unit is a corequisite with AFNR4102 and each student will work with an academic supervisor in an area of specialization and develop a well defined research project to be executed. The research project is undertaken to advance the students ability to build well-developed research skills, a strong analytical capacity, and the ability to provide high quality research results demonstrating a sound grasp of the research question. Working with an academic supervisor students will develop their ability to define a research project including the producing of testable hypotheses, identifying existing knowledge from reviewing the literature and the design and execution of a research strategy towards solving the research question. Students will build on their previous research and inquiry skills through sourcing a wide range of knowledge to solve the research problem and enhance their intellectual and personal autonomy by means of the development of experimental programs. Students will improve their written and planning skills by composing a research project proposal and the writing of a comprehensive literature review.

and 12 credit points of electives from Table FA1 and FA2.

AFNR4102
Research Project B

Credit points: 12 **Teacher/Coordinator:** Prof Budiman Minasny **Session:** Semester 2 **Classes:** No formal classes, approximately 18 hours per week **Prerequisites:** AFNR4101 **Assessment:** Oral presentation, research paper, poster. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is a continuation of the major research project initiated in AFNR4101 and continues to build on theoretical and applied knowledge gained across most of the units of study undertaken throughout their degree program. Working with their academic supervisor in the area of specialization the student will continue to pursue the defined research project towards presenting final results and conclusions. The research results are presented in a format of a research paper as submitted to a research journal. The research paper and corrected literature review is combined and presented together as a thesis. Students will continue to build their research skills, develop strong analytical capacity, demonstrate a sound grasp of the topic, and an ability to interpret results in a broad framework. Working with an academic supervisor students will develop their ability to produce results of high quality, draw reliable conclusions and identify future areas avenues of research. Students will build on their previous research and inquiry skills through sourcing a wide range of knowledge to solve the research problem and enhance their intellectual and personal autonomy by means of the managing the research program. Students will improve their communication skills through oral presentation of their research findings, the production of a poster detailing their research findings and the writing of a research paper.

and 12 credit points of electives from Table FA1 and FA2.

Elective unit of study descriptions

Table FA1

School of Economics units

AREC2001
Econ of Biological Production Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** ECON1001 or AGEC1006 or AGEC1102 **Assessment:** 2x1000wd Assignment (40%), 1x2hr Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is concerned with the application of microeconomic principles to management decisions in agricultural, forest, and fisheries systems. The unit builds on the theoretical knowledge acquired in previous studies and introduces the methods of applied economic analysis through a range of topics including: production functions (single and multi-output), cost and profit functions; methods for the measurement of productivity; optimisation in biological production systems; and production under risk.

AREC2002

Commodity Market and Price Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** ECON1001 or AGEC1006 or AGEC1102 **Assessment:** 1x50min Mid-semester Test (20%), 1xGroup Assignment (1000wd equiv) (20%), 1x2hr Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit focuses on the nature of agricultural and resource commodity markets, market demand relationships, market supply relationships, price determination under alternative market structures, marketing margin relationships, derived demand for inputs, spatially and temporally related markets, market dynamics, price expectations, commodity futures markets and other pertinent topics. Applied examples from the agricultural and resource industries and the overall economy will be used throughout the semester as illustrations of the principles involved.

AREC3001

Production Modelling and Management

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901 **Assessment:** 1x2hr Final Exam (60%), 1x50min Mid-semester Test (15%), 1x1500wd Assignment (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit builds on the principles of biological production economics and introduces optimisation methods to solve decision making problems encountered by agribusiness and natural resource firms and managers in public agencies. The principle focus is on the application of linear programming techniques, and students learn to consider solving decision making problems where the outcomes are not known with certainty, and where the timing of decisions is of essence.

AREC3002

Agricultural Markets

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901 **Assessment:** 1000wd equivalent problem sets (30%), 1x1500wd essay (30%), 1x2hr final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to provide an understanding of the underlying forces driving agricultural markets. It addresses price analysis and efficiency, including aspects of form, time and space in agricultural marketing; information and contracts; changing consumer concerns (food safety, ethical production); futures market and other risk sharing devices. Building on the application of microeconomic theory to both production and consumption in agricultural markets, its content is analytical. The unit also investigates some of the forces which prevent the efficient operation of world agricultural markets, including impediments to trade, imperfect markets for inputs and outputs and market power along the agricultural supply chain.

AREC3005

Agricultural Finance and Risk

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** AREC2001 or AGEC2103 or AREC2002 or AGEC2101 or ECOS2001 or ECOS2901 **Assessment:** 1x2hr Final Exam (70%), 2x1500wd Assignments (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Agricultural production is typically risky, adding complexity to decision analysis and increasing need of risk consideration in agricultural policy design. This unit explores this theme, and has two related components: risk and risk management in agriculture, and issues of agricultural producer finance. These two components cover a broad range of topics that incorporate production risk and other sources of risk in agriculture.

See Faculty of Arts and Social Sciences (Undergraduate) Handbook

Business School units

Students may take units of study from the following subject areas in the Business School: Accounting; Business Analytics; Banking; Business Information Systems; Commercial Law; Finance; Industrial Relations and Human Resources Management; International Business; Management; MarketingNotes: Prerequisites and/or co-requisites apply for most units. See the Business School (Undergraduate) Handbook

Table FA2

Students may only select two 2000 level units of study from Tables FA1 and FA2 to fulfil part of the requirements for Year 4.

AFNR3001

Agro-ecosystems in Developing Countries

Credit points: 6 **Teacher/Coordinator:** A/Prof Damien Field **Session:** Semester 1 **Classes:** One 18 days fieldtrip before the start of semester 1, online tutorials **Assessment:** Participation (20%), research topic proposal (20%), oral presentation (20%), major report (40%) **Practical field work:** One 18 day field school **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

AFNR5107

Principles of Biochemical Analysis

Credit points: 6 **Teacher/Coordinator:** Dr Claudia Keitel (Coordinator), Dr. Rosalind Deaker, Dr Thomas Roberts, A/Prof Michael Kertesz, Dr Feike Dijkstra, Dr Neil Wilson **Session:** Semester 1 **Classes:** 18 hours of lectures and 36 hours of laboratory during the semester **Prohibitions:** AGCH4007 **Assessment:** Assessment includes attendance and participation in lectures and practical classes. Each module will comprise 25% of the final assessment mark and satisfactory progress in all modules is required for the successful completion of this unit. (4x25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

AGEN3005

Flavour and Sensory Analysis

Credit points: 6 **Teacher/Coordinator:** Dr Malcolm Possell (Coordinator), Dr Kim-Yen Phan-Thien **Session:** Semester 1 **Classes:** Two 1-hour lectures, and one 3-hour practical per week **Prerequisites:** 12cp from (CHEM1XX1, CHEM1XX2, AGEN1006) **Assumed knowledge:** Knowledge of statistics from, or equivalent to that in, the 1st year Units of Study in the degrees in which this Unit is available. **Assessment:** One 2-hour final exam (40%), one literature review (10%), three lab reports (2 x 15% + 1 x 20% = 50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Textbooks

No prescribed textbook but recommended reading includes:
Delarue, Lawlor and Rogeaux (2015) Rapid Sensory Profiling Techniques: Applications in New Product Development and Consumer Research. Elsevier Ltd. http://www.sciencedirect.com/science/book/9781782422488;
Taylor and Linforth (2010) Food Flavour Technology 2nd Edition.

Taylor and Linforth. Wiley-Blackwell, UK.; Kilcast (2015) Instrumental Analysis of Food Sensory Quality: A Practical Guide. Woodhead Publishing. http://www.sciencedirect.com/science/book/9780857094391

AGEN3008
Indigenous Land and Food Knowledge

Credit points: 6 **Teacher/Coordinator:** Dr Peter Ampt (Coordinator), A/Prof Tina Bell **Session:** Semester 2 **Classes:** Application process, pre-trip orientation - 1 day, field trip Â¿ 10 days + travel time = 70 hours, post-trip workshop - 1 day. (Student financial contribution $2000-$2500) **Assessment:** Assessment during field trip: field trip activities recorded in booklet (20%), journal - personal/reflective (20%), participation peer and self-assessment (10%); assessment post-field trip: one 3000wd feasibility study, funding application and essay due week 7 Semester 2 (50%); Out of class prescribed student workload: application process - Kinship module 1-hour, written application 2-hours. Prepare report Â¿ five hours for seven weeks **Mode of delivery:** Field experience

Note: Department permission required for enrolment. Note: Students must attend pre-trip briefing session (one day in S1 exam period), field trip (approximately two weeks in mid-year break) and post-trip workshop (one day in S2).

Textbooks

No prescribed textbook but recommended reading includes: Gammage B (2011) The Biggest Estate on Earth: How Aborigines made Australia, Allen and Unwin, Crows Nest, Sydney, Australia; Svieby K, Skuthorpe T (2006) Treading Lightly: The Hidden Wisdom of the World's Oldest People, Allen and Unwin, Crows nest, Sydney, Australia; Bird Rose D (2000) Dingo Makes us Human: Life and Land in an Australian Aboriginal Culture, Cambridge University Press, Cambridge, UK

AGEN5001
Agricultural and Environmental Extension

Credit points: 6 **Teacher/Coordinator:** Dr Peter Ampt **Session:** Semester 1 **Classes:** One 2-hour lecture per week, one 2-hour tutorial per week, one field trip (three days) **Assessment:** 1500wd essay (20%), tutorial/workshop participation (30%), 3000wd problem based learning project (30%), field trip report (20%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Textbooks

Recommended reading, Jennings, J., Packham R. and Woodside, D.(eds) (2001) Shaping Change APEN; Hay, I (2012) Communicating in Geography and the Environmental Sciences, Oxford

AVBS4002
Dairy Production and Technology

Credit points: 6 **Teacher/Coordinator:** Prof Sergio (Yani) Garcia **Session:** Semester 2 **Classes:** Lectures up to 3 hours per week, practicals 3 hours per week **Assumed knowledge:** Enrolled students are expected to have some understanding of key components of the dairy production system, including basic knowledge of animal physiology and nutrition. **Assessment:** Assignment (report or lit review) (30%), pracs assessments, (30%), 1-hour exam (40%) **Practical field work:** At least two half day field trips and one or two full day trips/excursions including commercial farms and a milk processing plant **Mode of delivery:** Normal (lecture/lab/tutorial) day

Textbooks

Students are advised to consult lecturers for recommended text, scientific and professional articles, technotes for advisors and industry-generated information for farmers

AVBS4004
Food Safety Assessment and Management

Credit points: 6 **Teacher/Coordinator:** Dr Gary Muscatello **Session:** Semester 2 **Classes:** Lectures 3 hours per week, tutorial/practicals 2 hours per week **Prerequisites:** AVBS3001 and AVBS4001 **Assessment:** 1000wd individual report (20%), 1000wd group assignment (20%), 2-hour exam (50%), MCQ (10%) **Practical field work:** Two field trips (compulsory) 16 hours total **Mode of delivery:** Normal (lecture/lab/tutorial) day

Textbooks

Torrence ME and Isaacson RE (eds) 2003, Microbial food safety in animal agriculture current topics, Iowa State Press, Ames, Iowa
D'Mello JPF (ed.) 2003, Food safety: contaminants and toxins, CABI Publishing, Wallingford
Bucic S 2006, Integrated food safety and veterinary public health, CABI Publishing, Wallingford
Jay JM, Loessner MJ, Golden DA 2005, Modern Food Microbiology, 7th edn, Springer, New York
Colville J, Berryhill, D 2007, Handbook of Zoonoses - Identification and Prevention, Elsevier Mosby, St.Louis, MO USA

AVBS4008
Intensive Animal Industries

Credit points: 6 **Session:** Semester 2 **Classes:** 6 hours per week **Prerequisites:** (Animal and Veterinary Bioscience years 1-3) OR (Bachelor of Science in Agriculture years 1-3) **Assessment:** Written exam (50%) (poultry and pigs 50:50), in course evaluations and case study - pigs (25%), broiler growth study report and in course evaluations - poultry (25%) **Practical field work:** Visits to an intensive pig/poultry farm, feed mill and poultry production and processing units when biosecurity restrictions allow **Mode of delivery:** Normal (lecture/lab/tutorial) day

Textbooks

There is no single text that adequately covers the Australian pig industry and for this reason no formal text is required.

AVBS4012
Extensive Animal Industries

Credit points: 6 **Teacher/Coordinator:** A/Prof Russell Bush **Session:** Semester 1 **Classes:** Lectures 3 hours per week, practicals 3 hours per week **Prerequisites:** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3 **Assessment:** Case study (10%), practical report (15%), meat grading (15%), excursion report (20%) and written exam (40%) **Practical field work:** Five-day study tour to the Riverina **Mode of delivery:** Normal (lecture/lab/tutorial) day

ENVX2001
Applied Statistical Methods

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 3-hour computer practical per week **Prerequisites:** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] **Assessment:** One exam during the exam period (50%),three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

HORT3005
Production Horticulture

Credit points: 6 **Teacher/Coordinator:** Prof Daniel Tan **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 3-hour practical/workshop per week **Prerequisites:** (AGEN2001 and AGEN2005) or BIOL2X30 or BIOL2X31 or BIOL2X23 or AGEN2002 or AGRI2001 **Assessment:** One 3-hour exam (55%), three assignments (45%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Textbooks
Recommended reading:
Louis Glowinski (2008) The complete book of fruit growing in Australia.
Lothian Books, Westwood, M.N. (1993) Temperate-zone pomology. Timber Press Inc.
Jackson, J.E (2003) Biology of apples and pears. Cambridge University Press.
Gopinadhan Paliyath et al. (Ed.) (2008) Postharvest biology and technology of fruits, vegetables, and flowers. Oxford: Wiley-Blackwell
Decoteau, D/. R (2000). Vegetable Crops. Upper Saddle River, NJ: Prentice Hall

HORT4005
Research and Practice in Horticulture

Credit points: 6 **Teacher/Coordinator:** A/Prof Brian Jones (Coordinator), Dr Kim-Yen Phan-Thein **Session:** Semester 2 **Classes:** One 2-hour tutorial per week; one 1-week excursion **Prerequisites:** HORT3005 **Assessment:** Industry reports (2x20%), field trip industry report (10%), two practical reports (2x10%), end of semester exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

PHYS5031
Ecological Econ and Sustainable Analysis

Credit points: 6 **Teacher/Coordinator:** Dr Arunima Malik **Session:** Semester 1 **Classes:** 1.5-hour lecture interspersed with hands-on exercises per week, and 1 hour seminar per week. **Assessment:** Essay, presentation and comprehensive diary/notes from lectures (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

PHYS5033
Environmental Footprints and IO Analysis

Credit points: 6 **Teacher/Coordinator:** Dr Arunima Malik and Prof Manfred Lenzen **Session:** Semester 1, Semester 2 **Classes:** 2-hour lecture interspersed with hands-on exercises per week **Assessment:** Comprehensive diary/notes from lectures, including a quantitative example (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Minimum class size of 5 students.

PHYS5034
Life Cycle Analysis

Credit points: 6 **Teacher/Coordinator:** Dr Arunima Malik **Session:** Semester 2 **Classes:** 2.5-hour lecture interspersed with hands-on exercises per week **Assessment:** Essay, presentation and comprehensive diary/notes from lectures (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Minimum class size of 5 students.

All students complete an Agribusiness Major and a Food Science Major

Table 1A - Agribusiness Major

Year 1

BUSS1000
Future of Business

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 1.5 hour lecture every week (13), 1.5 hr tutorial each week, guided learning material (e.g. videos, podcasts, contemporary case studies etc.). 8x 1.5 hr workshops: Students who are identified as benefiting from additional academic support (a written diagnostic is administered during week 1 of the BUSS1000 tutorials) will be required to attend a 1.5 hour weekly workshop from Week 3 on Business Communication and Academic Writing (BCAC). **Prohibitions:** BUSS1001 **Assessment:** Case study (25%), team presentation (25%), tutorial attendance and participation (15%), final exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This compulsory first year unit is designed to provide commencing undergraduate students with insights into the study and the practice of business. Students gain foundational knowledge in relation to business stakeholders, business challenges and the ways in which business leaders might approach responding to these challenges. Key stakeholders within and external to organisations are identified and their interests are analysed. Critical business challenges such as climate change and sustainability, the future of work and workforce diversity are investigated. The way that these challenges affect different types of business, sectors and stakeholders is analysed and responses constructed to them. The unit is delivered in a blended format, with face-to-face lectures, seminars, and interactive online modules. Success in this unit is determined by strong application of critical, strategic and cross-disciplinary thinking, as well as the ability to demonstrate business knowledge and problem solving skills through effective written and oral communication.

ENVX1002
Introduction to Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Thomas Bishop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour tutorial per week, one 2-hour computer practical per week **Prohibitions:** ENVX1001 **Assessment:** One exam during the exam period (50%), three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This is an introductory statistics unit for students in the agricultural, life and environmental sciences. It provides the foundation for statistics and data science skills that are needed for a career in science and for further study in applied statistics and data science. In the first portion of the unit the emphasis is on describing data using statistical and graphical summaries, and probability models. In the second part the focus is on formal hypothesis testing on experimental data using statistical tests. The final part of the unit is on finding patterns in biological and environmental data, through the use of linear and non-linear functions. In the practicals the emphasis is on applying theory to analysing real datasets using the spreadsheet package Excel and the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks
No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).

- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

AGEC1006
Economic Environment of Agriculture

Credit points: 6 **Session:** Semester 2 **Classes:** 2x1hr lectures/week, 1x1hr tutorial/week **Prohibitions:** AGEC1003 or AGEC1004 **Assumed knowledge:** HSC Mathematics **Assessment:** 1x2hr exam (55%) and 1x50 min mid-semester exam (25%) and workshop papers (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to give an understanding of some basic economic principles and to introduce the characteristics of the economic environment in which Australian agriculture operates. Topics to be covered include the structure, nature and history of the agricultural industries in Australia; agricultural adjustment in the world economy; introductory principles of production economics and farm management; elementary price theory and the factors affecting the demand, supply and prices of agricultural commodities.

Textbooks

HE Drummond and JW Goodwin, Agricultural Economics, 3rd edn (Prentice-Hall, 2011)

ENVI1003
Global Challenges: Food, Water, Climate

Credit points: 6 **Teacher/Coordinator:** A/Prof Stephen Cattle **Session:** Semester 2 **Classes:** Two lectures per week, 2hour tutorial/computer lab per week, two-day weekend field trip **Assessment:** One 2-hour exam (50%), field trip report (15%), tutorial presentation (20%), GIS reports (15%) **Practical field work:** Computer practicals and two day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

In the 21st century the population of the world will increase both in size and its expectation in terms of food, energy and consumer demands. Against this demand we have a planet in crisis where natural resources are degraded, biodiversity is diminishing and planetary cycles related to climate are reaching points of irreversible change. Management of our precious natural resources is a balancing act between production and conservation as always, but now we have to do this against a background of potential large scale changes in climate. In this unit students will gain an understanding of the key environmental challenges of the 21st century; namely food security, climate change, water security, biodiversity protection, ecosystems services and soil security. In the second half using Australian case studies we will explore how we manage different agro-ecosystems within their physical constraints around water, climate and soil, while considering linkages with the global environmental challenges. Management now, in the past and the future will be considered, with an emphasis on food production. This unit is recommended unit for students interested in gaining a broad overview of the environmental challenges of the 21st century, both globally and within Australia.

Year 2 and 3 Units

BUSS1030
Accounting, Business and Society

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 1x 1.5hr lecture and 1x 1.5hr tutorial per week **Prohibitions:** ACCT1001 or ACCT1002 or ACCT1003 or ACCT1004 or ACCT1005 **Assessment:** tutorial contribution (10%), assignment (15%), mid-semester examination (25%), final examination (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit investigates the fundamentals of accounting and aims to provide a broad understanding of the role of accounting in the context of business and society. The format of the unit is designed to show that there are many uses of accounting data. The focus moves from accountability to decision making; both functions are explained through examples such as the 'double entry equation', and from an output (financial statements) perspective. Some more technical aspects of accounting are outlined, including the elements of assets, liabilities, revenues and expenses within simple, familiar scenarios. Besides developing an understanding of the role of accounting via conventional financial reports, recent developments including the discharge of accountability by companies through the release of corporate social and environmental reports and the global financial crisis, are explored through an accounting lens.

MKTG1001
Marketing Principles

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 1x 2hr lecture and 1x 1hr tutorial per week **Assessment:** project (20%), presentation (15%), participation (7%), mid-semester exam (28%), final exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines the relationships among marketing organisations and final consumers in terms of production-distribution channels or value chains. It focuses on consumer responses to various marketing decisions (product mixes, price levels, distribution channels, promotions, etc.) made by private and public organisations to create, develop, defend, and sometimes eliminate, product markets. Emphasis is placed on identifying new ways of satisfying the needs and wants, and creating value for consumers. While this unit is heavily based on theory, practical application of the concepts to "real world" situations is also essential. Specific topics of study include: market segmentation strategies; market planning; product decisions; new product development; branding strategies; channels of distribution; promotion and advertising; pricing strategies; and customer database management.

ITLS2000
Managing Food and Beverage Supply Chains

Credit points: 6 **Session:** Semester 2 **Classes:** 1 x 3 hr seminar/tutorial per week **Prohibitions:** AGEN2003 or AGEN1005 **Assessment:** tutorial quiz (10%), individual assignement (35%), group project report (15%), group project presentation (10%), final 2hr exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The food and beverage sector is one of the key economic activities in virtually all countries in the world today. When it comes to logistics and supply chain management within this sector, there is a level of complexity, not frequently found in other industries. This includes the need to consider products bulkiness, perishability and seasonality, coupled with potential additional infrastructure requirements in respect of temperature-controlled storage and transport. As a consequence, there is a higher imperative to have a well-designed end-to-end supply chain. Equally, it is important to understand issues from the perspectives of the various actors in food and beverage supply chains including farms, processing units, wholesalers / distributors, and retailers. Overarching the structuring of any food and beverage supply chain will be consideration of issues such as perishability, quality and risk. Further, for a supply chain to be effective and efficient consideration also needs to be given to the support functions of information management, use of technology, and financial reporting. In today's world, companies compete on supply chains. Those who have the ability to establish a distinctive supply chain and create it as a strategic asset will therefore emerge as industry leaders.

AGEN3003
Global Food and Nutrition Security

Credit points: 6 **Teacher/Coordinator:** A/Prof Brian Jones (Coordinator), Academics from a range of Schools and Faculties will present material in this unit. **Session:** Intensive August **Classes:** Intensive Unit - Weeks 1-4, 15 contact hours per week (lectures, workshops and tutorial sessions) **Prerequisites:** AGEN2002 and AGEN2003 and AGEN2006 **Assumed knowledge:** 48 Credit Points of Junior and Intermediate units. **Assessment:** One group presentation (60%), one individual assignment (30%), one viva voce (10%). **Practical field work:** Six excursions/practical sessions over four weeks (weeks 1 - 4) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Humanity has made great progress towards a food secure world over the past several decades. Continuing this progress in a world where environmental constraints are becoming increasingly obvious is the next great challenge. The shortfalls in global food security are manifested in particular by the triple burden of malnutrition/undernutrition, micronutrient deficiencies, and obesity. In this unit, students will explore state-of-the-art research, analysis, and global visions for a food secure planet from a wide range of perspectives, including technological, biophysical, behavioural, economic, institutional, political, and social. The course ranges across disciplines and spatiotemporal scales to examine the synergies and trade-offs between human health, social, environmental, and economic objectives and outcomes. Case studies will be used throughout the unit. Students will gain research and inquiry skills through a major research-based project. At the successful completion of the unit, students will have the core knowledge and skills to enable them to critically analyse policy, development and research goals and settings and their impact on global and regional food security.

Textbooks
No prescribed textbooks

Students are also required to complete 18 credit points of elective units from Table FA1 for the Agribusiness Major.

Table 1B - Food Science Major

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

or

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

or

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks

Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

or

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

or

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating

genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

CHEM1012

Fundamentals of Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1XX1 **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Fundamentals of Chemistry 1B is built on a satisfactory prior knowledge of Fundamentals of Chemistry 1A. Compared to the mainstream Chemistry 1B, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1112

Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2 **Classes:** 1x3-hr lecture; 1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviours, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do we develop lotions that don't burn us, how do we measure UV absorption by sunscreens, how can we measure and alter soil pH, how are sticky things made, and how do we determine the concentration of vitamin C in juice? Through enquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B is built on a satisfactory prior knowledge of Chemistry 1A.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1912

Chemistry 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B (Advanced) is built on a satisfactory prior knowledge of Chemistry 1A (Advanced). Compared to the mainstream Chemistry 1B, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Year 2 and 3 units

AGEN2001
Plant Function

Credit points: 6 **Teacher/Coordinator:** A/Prof Tina Bell (Coordinator), Dr Thomas Roberts **Session:** Semester 1 **Classes:** Two 1-hour lectures, One 3-hour practical per week **Prerequisites:** 6cp from (BIOL1XXX or AGEN1004) and 12cp from (CHEM1XX1 or CHEM1XX2 or AGEN1006) **Prohibitions:** PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906 **Assessment:** One 1-hour mid-semester exam (25%), one 1-hour final exam (25%), 1 x 1000wd essay (10%), four practical reports (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to develop an understanding of the structural and molecular principles that underlie the function of plants and how these principles relate to the use of plants by humans as sources of food, fibre and fuel.

The unit is a core unit for BScAgr students and an elective for BSc and other degree programs. It recognizes the specialized nature of plant anatomy and biochemistry and is a platform for students who wish to gain a sound knowledge of plant growth and development.

This unit covers the structure of plant cells and the anatomy of the major tissues and organs of plants. It also covers the biochemistry of the main carbohydrate, lipid, protein and nucleic acid constituents of plants, as well as the metabolic pathways that regulate plant growth and development.

At the completion of this unit students will be able to demonstrate theoretical knowledge of the structure and function of plants. Students will also be able to demonstrate abilities in the practice of laboratory methods used to analyse plants and the effective communication of experimental findings.

Students enrolled in this unit will gain research and enquiry skills through attendance at lectures and participation in laboratory classes and tutorials; information literacy and communication skills through the synthesis of information used to prepare practical reports; social and professional understanding by participation in group-work and assessments that seek to demonstrate the role of agriculture in the broader community.

Textbooks

Taiz L, Zeiger E (2010) Plant Physiology 5th ed.

AGEN2002
Fresh Produce Management

Credit points: 6 **Teacher/Coordinator:** Dr Rosalind Deaker **Session:** Semester 1 **Classes:** Two 1-hour lectures per week **Prerequisites:** 6cp from (BIOL1XXX or AGEN1004 or MBLG1XX1) **Assumed knowledge:** HSC level Mathematics and Biology and CHEM1XX1 or CHEM1XX2 or CHEM1903 or CHEM1904 **Assessment:** Three practical reports (15% each), one group presentation (15%), one end of semester exam (40%) **Practical field work:** Two field trips, six practical sessions per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers some fundamental concepts in food science with a particular emphasis on post-harvest management of fresh produce. Students will critically examine the science underpinning management and handling of fresh food products. The unit primarily addresses the challenges of maintaining quality, extending shelf life and improving safety of fresh perishable produce by examining relevant industrial practices and technologies.. Students will develop practical skills and integrate knowledge of physiology, technology and economics of fresh produce management to determine optimal storage and handling conditions for maximum quality, shelf life, safety and ultimately consumer experience. The majority of examples will be drawn from fruits and vegetables, dairy, eggs, meat and seafood products. Industry quality assurance schemes and government regulations will be examined, with particular reference to food safety. The students will gain research, inquiry and communication skills through a research-based group project, an oral presentation and laboratory reports. Personal and intellectual autonomy will be developed through group and individual work.

Textbooks

No prescribed textbooks

AGEN2006
Animal Production and Management

Credit points: 6 **Teacher/Coordinator:** A/Prof Luciano Gonzalez **Session:** Semester 2 **Classes:** Two 1-hour lectures per week **Prerequisites:** 12cp from (BIOL1XXX, AGEN1004) and 12cp from (CHEM1XX1, CHEM1XX2, AGEN1006) **Prohibitions:** AVBS1002 **Assumed knowledge:** HSC level Mathematics and Biology **Assessment:** One 2-hour final exam (50%), four online quizzes (20%), reflective statement (5%), handling and husbandry resource guide (20%), lectures and practicals attendance (5%) **Practical field work:** Six excursions/ practical sessions per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to develop the student's ability to critically examine and evaluate the production and management of animals used for food and fibre in Australia and internationally. The unit will focus on new and emerging issues in animal production, including productivity, welfare, remote monitoring and management, animals in the environment, and meeting specifications in an ever-evolving marketplace. The identification, selection and breeding of animals that are optimally suited to production systems is a focus. New thinking and innovations that are being used to address scientific, industry and social expectation challenges will be a feature of the unit and case studies will be used throughout to examine interactions between these factors and their impact on management practices. Students will gain research and inquiry skills through research based group projects, information literacy and communication skills through online discussion postings, laboratory reports and presentations, and personal and intellectual autonomy through working in groups. At the successful completion of the unit, students will have the core knowledge and skills to enable them to lead developments in production animal industries in Australia and overseas.

Textbooks

No prescribed textbooks

MICR2031
Microbiology

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2931 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45-minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: one written assignment (15%), one group oral presentation (10%) and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the earth's trees. This unit of study will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require if you specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology or science education.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

or

MICR2931

Microbiology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prerequisites:** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2031 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45 minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: two written assignments (10%, 15%), and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the Earth's trees. In this unit of study you will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Detailed aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require to specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology, or science education. As an Advanced unit, MICR2931 provides increased challenge and academic rigour to develop a greater understanding and depth of disciplinary expertise. You will actively participate in a series of small group tutorials investigating the molecular detail of microbial communication and function, which will culminate in you creating a scientific research report that communicates your understanding of recent research in microbiology.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

AGCH3025

Chemistry and Biochemistry of Foods

Credit points: 6 **Teacher/Coordinator:** Dr Thomas Roberts (Coordinator), Prof Les Copeland **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 4-hour practical fortnightly **Prohibitions:** AFNR5102 or AGCH3017 or AGCH3024 **Assumed knowledge:** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **Assessment:** One 2-hour exam (40%) and six lab reports (6x10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to give students an understanding of the properties of food constituents, and the interactions between these constituents during food processing, storage and digestion. The unit will develop an understanding of the relationship between form and functionality of constituents and the concept of fitness-for-purpose (i.e., quality) in converting agricultural products into foods. Students will gain an appreciation of the relationship between chemical composition and properties of macroconstituents (carbohydrates, proteins, lipids) and microconstituents (vitamins, minerals, antioxidants, flavour and anti-nutritional chemicals) and their functions in plant- and animal-based foods. The material presented in lectures and practical classes will enable students to develop research and inquiry skills and an analytical approach in understanding the biochemistry of foods, food processing and storage. On completing this unit, students will be able to describe the chemical and biochemical properties of major food constituents, and demonstrate an understanding of the functionality of these constituents in food processing and nutrition. Students will have gained experience in laboratory techniques used in industry for the analysis of some food products, and information literacy and communication skills from the preparation of practical reports.

Textbooks

Lecture and laboratory notes will be made available through Blackboard. There is no recommended textbook.

AGEN3001

Food Product Development

Credit points: 6 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien **Session:** Intensive August **Classes:** Intensive Unit - twelve 4-hour workshops over four weeks **Prerequisites:** 6cp from AGEN3004 **Assumed knowledge:** 6cp from (BIOL1XXX, MBLG1XXX) and 6cp from CHEM1XXX **Assessment:** One individual assignment (20%), one group project report (60%), one group presentation (20%) **Practical field work:** Six practical sessions **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this unit of study, students will gain a theoretical and practical understanding of the development of novel food products using traditional and novel food ingredients. Students will examine processes in market trend analysis, product innovation, prototype development, product testing and the formal presentation of a new product. They will develop practical skills in product research and development through a group design project that will require application of product development principles and integration of knowledge regarding product specifications, ingredient interactions and food processing. Product quality, functionality, shelf-life, safety, nutritional and health implications are key considerations in the design process. This is an intensive unit taught as a series of workshops over the first four weeks of semester. It is designed to be taken as one of the final core units in the food science major of the BFoodAgrib as it integrates learnings from across the program and offers a great platform for exploration of product development ideas, that could potentially be expanded in 4th year research projects.

Textbooks

No prescribed textbooks

AGEN3004

Food Processing and Value Adding

Credit points: 6 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien **Session:** Semester 1 **Classes:** Two 1-hour lectures per week **Prerequisites:** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX) **Assessment:** Two individual assignments (10% + 20%), one group processing report (20%), one group oral presentations (10%), one 2-hour final exam (40%) **Practical field work:** One 3-hour practical or excursion per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

From the grinding of grains to the drying of meats, humans have been processing their food since the dawn of civilisation. Over the decades, many traditional processing methods have become industrialised, while new processing technologies have emerged, quietly revolutionising our food systems, diets and cultures. In this unit of study, students examine the biochemical and physicochemical transformations that occur in food materials during processing and how processing parameters affect the fulfilment of food quality, shelf-life, and safety objectives. The unit is roughly organised into modules on (1) processing to modify food structure; (2) processing for preservation; and value-adding, focused on (3) healthier food and (4) fermentation as interesting case studies in food processing.The unit will include lectures, laboratory sessions, group work and visits to food processing facilities.

Textbooks
No prescribed textbooks

Bachelor of Medical Science

Please note:

The following course resolution is published subject to approval by the Academic Board on 28 November 2017.

Bachelor of Medical Science

Bachelor of Medical Science (Honours)

These resolutions must be read in conjunction with the applicable University By-Laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014 ('the Coursework Policy'), the Learning and Teaching Policy 2015, the Resolutions of the Faculty of Science, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BPMEDSCI-02	Bachelor of Medical Science
BHMEDSCH-01	Bachelor of Medical Science (Honours)

2 Attendance pattern

The attendance pattern for this course is full time or part time according to student choice.

3 Admission to candidature

(1) Admission to undergraduate courses at the University of Sydney is either on the basis of completion of secondary study via the NSW Higher School Certificate, leading to the award of an Australian Tertiary Admission Ranking (ATAR) or equivalent (and subject to special admissions provisions as set out in the Coursework Rule), or on the basis of Mature Age Admission as set out in the Admissions chapter of the Coursework Policy.

(2) Transferring into the Intermediate year of the Bachelor of Medical Science degree. A limited number of students may be permitted to transfer into the course at the beginning of the Intermediate year after completing the first year of a degree with the same or very similar content to the Bachelor of Medical Science. Applicants must complete all of the units of study deemed equivalent by the faculty. Selection is based solely on performance in the first year units of study.

4 Requirements for award

(1) The units of study that may be taken for this award are set out in Table IV for the Bachelor of Medical Science. The Dean may permit a candidate of exceptional merit who is admitted to the Talented Student Program to undertake a unit or units of study within the Faculty other than those specified in Table IV.

(2) To qualify for the award of the pass degree, a student must successfully complete 144 credit points, comprising:

(a) a major from a Science discipline area listed in Table I, which will be recorded on the Testamur;

(b) a minimum of 48 credit points from Junior units of study as specified in Table IV A;

(c) no more than 60 credit points of junior units of study;

(d) 36 credit points of Intermediate core units of study listed in Table IV B;

(e) a minimum of 12 credit points of Senior units of study in a medical science area as listed in Table IV C; and

(f) no more than 12 credit points of units of study from outside Tables I and IV.

5 Progression rules

(1) Except with the permission of the Dean, students may not enrol in an intermediate core unit of study until they have completed ~~42 credit points from junior Bachelor of Medical Science units of study or~~ at least 30 credit points taken from the following: junior Biology (12 credit points max), junior Mathematics (12 credit points max), junior Chemistry (12 credit points max).

(2) Students may not enrol in a senior unit of study until they have completed 18 credit points of intermediate core units of study including BMED2401.

6 Requirements for the Honours degree

(1) Honours is available to meritorious students who complete an additional year of full time study.

(2) Admission, requirements and award of honours are according to the Coursework Policy and the Resolutions of the Faculty of Science.

(3) To qualify for the award of the honours degree, a student must complete 48 credit points of honours units of study in one of the honours subject areas listed in Table IV F.

7 Award of the degree

(1) The Bachelor of Medical Science is awarded as either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Third Class according to the Coursework Policy and the rules specified in the Resolutions of the Faculty of Science.

(2) Candidates for the award of the Honours degree who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

8 Transitional provisions

(1) These resolutions apply to all candidates enrolled or commencing their candidature after 1 January, 2012.

(2) Candidates who commenced their candidature prior to 1 January, 2012 may elect to complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that requirements are completed by 1 January, 2017, or later date as the Faculty may, in special circumstances, approve.

(3) Candidates who have completed some, but not all, required intermediate core units listed in Table IV prior to 1 January 2012, will proceed as follows:

(a) candidates who have completed 36-48 credit points from BMED280X units including BMED2801, will be deemed to have completed the intermediate core requirements listed in Table IV under these resolutions;

(b) candidates who have completed at least 36 credit points from BMED280X units, not including BMED2801, will be required, in addition, to complete BMED2401;

(c) candidates who have completed 18-30 credit points from BMED280X units will be advised on the outstanding intermediate core requirements listed in Table IV under these resolutions, and will be required to complete the equivalent of 36 credit points from BMED240X units;

(d) candidates who have completed 6-12 credit points from BMED280X units, not meeting the progression requirements listed under Section 5, above, will be advised to transfer to the BSc degree.

(4) Candidates who have completed some, but not all, required junior or intermediate core units listed in Table IV prior to 1 January 2019, will proceed as follows:

(a) candidates who have completed 30-36 credit points from BMED240X will be deemed to have completed the intermediate core requirements listed in Table IV under these resolutions;

(b) candidates who have completed 18-24 credit points from BMED240X units will be advised on the outstanding intermediate core requirements listed in Table IV under these resolutions, and will be required to complete the equivalent of 30 credit points from BMED240X units taken from MEDS200X units;

(c) candidates who have completed 6-12 credit points from BMED240X units, not meeting the progression requirements listed under Section 5, above, will be advised to transfer to the Bachelor of Science or the Bachelor of Science (Medical Science).

(d) candidates who have completed less than 30-42 credit points from junior Bachelor of Medical Science units of study not meeting the progression requirements listed under Section 5, above, will be advised to transfer to the Bachelor of Science or the Bachelor of Science (Medical Science).

(5) Students who commenced their degree prior to 1 January 2018 or who progress according to degree resolutions applicable to students commencing before that date may take major/s from the major/s listed under 'Transitional Provisions' in Table 1.

Bachelor of Medical Science

Table IV Bachelor of Medical Science

Please note:

The following degree table is published subject to approval by the Academic Board on 28 November 2017.

Unit of study	***Credit points***	***A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition***	***Session***
A. Junior units of study			
Candidates are required to complete: (i) 12 credit points of Junior units of study from the Science Subject Area of Chemistry; and (ii) 12 credit points of Junior units of study from the Science Subject Area of Mathematics; and (iii) 12 credit points of Junior units of study from the Science Subject Area of Biology; and (iv) 12 credit points of Junior units of study from the Science Subject Area of Physics (excluding PHYS1500); or 12 credit points of Junior units of study from the Science Subject Area of Psychology; or 6 credit points of Junior Physics (excluding PHYS1500) and 6 credit points of Junior Psychology.			
B. Intermediate units of study			
Candidates are required to complete 36 credit points of Intermediate core units of study. These may all be taken in Year 2 of a standard candidature, or as BMED(2401, 2402, 2404 and 2405) in Year 2 and BMED(2403 and 2406) in Year 3, as shown in the sample enrolment tables.			
BMED2401 **Cellular Foundations of Medical Sciences**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2910 or ANAT2011 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2029 or BIOL2929 OR BIOL2016 or BIOL2916 or BMED2801 or BMED2802 or BIOL2906 or IMMU2101 or MICR2021 or MICR2921 or MICR2022 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906 *Faculty of Science (with the cooperation of the Faculty of Medicine), Coordinated by the Discipline of Anatomy and Histology*	Semester 1
BMED2402 **Nerve and Muscle**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2806 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906	Semester 1
BMED2403 **Cardiovascular and Respiratory Systems**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2910 or ANAT2011 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2803 or IMMU2101 or MICR2021 or MICR2921 or MICR2022 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906	Semester 1
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
BMED2405 **Gut and Nutrient Metabolism**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
BMED2406 **Hormones, Kidney and Reproduction**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2805 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2912 or NUTR2911 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906	Semester 2
In addition, candidates may take Intermediate units of study from Table I for which they have satisfied the prerequisites. However, candidates are prohibited from taking the following units of study due to substantive overlap in content with the Intermediate core units of study: (i) intermediate units of study offered by the School of Medical Sciences (exceptions listed below); and (ii) IMMU2101; and (iii) BIOL2016/2916; BIOL2029/2929; MICR2021/2921; MICR2022/2922; MICR2024; BCHM2072/2972 Exceptions - The following intermediate units offered by the School of Life and Environmental Sciences and the School of Medical Sciences are permissible:			
ANAT2009 **Comparative Primate Anatomy**	6	**A** BIOL1XX3 OR BIOL1XX8 **N** ANAT2002	Semester 2
BCMB2002 **Proteins in Cells**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2902	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BCMB2902 **Proteins in Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2002	Semester 2
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
PCOL2012 **Pharmacology: Drugs and People**	6	**A** (BIOL1XXX or MBLG1XX1) and PCOL2011 **P** 6cp from CHEM1XXX **N** PCOL2555	Semester 2

C. Senior units of study

Candidates are required to take a minimum of 12 credit points of Senior units of study from the subject areas of: Anatomy, Applied Medical Science, Biology (Genetics) (i.e. BIOL3018/3918, BIOL3026/3926), Biochemistry, Cell Pathology, Histology, Immunology, Infectious Diseases, Microbiology, Neuroscience, Nutrition and Metabolism, Pharmacology, Physiology, Virology.

Note: INFD3012 is only available to students enrolled in the Bachelor of Medical Science degree and does not contribute to a major listed in Table I.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
INFD3012 **Infectious Diseases**	6	**P** BMED2401 and BMED2404 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

D. Majors

A complete list of available majors is set out in Table I. Of these, the majors available in medical science discipline areas are: Anatomy and Histology*, Applied Medical Science (Transitional Provision), Biochemistry*, Cell Pathology, Immunobiology*, Microbiology*, Molecular Biology and Genetics*, Neuroscience*, Nutrition and Metabolism, Pharmacology* and Physiology*.

* indicates a major in this area is also available at the advanced level

E. Study in other faculties

A total of 12 credit points of units of study from non-science discipline areas may be counted towards the Bachelor of Medical Science degree. Students should consult the handbooks from other faculties to determine any prerequisites, corequisites or other requirements relating to enrolment in units of study offered by departments in these faculties.

Note: Students may not enrol in BUSS1020, ECMT1010, ENVX1001, STAT1021, or any other unit of study deemed mutually exclusive with units of study listed in Table I.

F. Honours units of study

The units of study required to undertake Honours in the Bachelor of Medical Science degree are provided in Table I.

Note: Honours in the subject area of Infectious Diseases is only available to students enrolled in the the Bachelor of Medical Science degree. Its units are listed below. These Honours units of study designated as A, B, C, D should be taken in that order, whether a student enrols full-time, part-time or mid-year.

Infectious Diseases

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
INFD4011 **Infectious Diseases Honours A**	12	**N** BMED4021 *Note: Department permission required for enrolment*	Semester 1
INFD4012 **Infectious Diseases Honours B**	12	**C** INFD4011 **N** BMED4022	Semester 1
INFD4013 **Infectious Diseases Honours C**	12	**C** INFD4012 **N** BMED4023	Semester 2
INFD4014 **Infectious Diseases Honours D**	12	**C** INFD4013 **N** BMED4024	Semester 2

Bachelor of Medical Science

Table IV Bachelor of Medical Science

Please note:

The following degree table is published subject to approval by the Academic Board on 28 November 2017.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
A. Junior units of study			
Candidates are required to complete: (i) 12 credit points of Junior units of study from the Science Subject Area of Chemistry; and (ii) 12 credit points of Junior units of study from the Science Subject Area of Mathematics; and (iii) 12 credit points of Junior units of study from the Science Subject Area of Biology; and (iv) 12 credit points of Junior units of study from the Science Subject Area of Physics (excluding PHYS1500); or 12 credit points of Junior units of study from the Science Subject Area of Psychology; or 6 credit points of Junior Physics (excluding PHYS1500) and 6 credit points of Junior Psychology.			
B. Intermediate units of study			
Candidates are required to complete 36 credit points of Intermediate core units of study. These may all be taken in Year 2 of a standard candidature, or as BMED(2401, 2402, 2404 and 2405) in Year 2 and BMED(2403 and 2406) in Year 3, as shown in the sample enrolment tables.			
BMED2401 **Cellular Foundations of Medical Sciences**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2910 or ANAT2011 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2029 or BIOL2929 OR BIOL2016 or BIOL2916 or BMED2801 or BMED2802 or BIOL2906 or IMMU2101 or MICR2021 or MICR2921 or MICR2022 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906 *Faculty of Science (with the cooperation of the Faculty of Medicine), Coordinated by the Discipline of Anatomy and Histology*	Semester 1
BMED2402 **Nerve and Muscle**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2806 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906	Semester 1
BMED2403 **Cardiovascular and Respiratory Systems**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2910 or ANAT2011 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2803 or IMMU2101 or MICR2021 or MICR2921 or MICR2022 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906	Semester 1
BMED2404 **Microbes, Infection and Immunity**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
BMED2405 **Gut and Nutrient Metabolism**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011	Semester 2
BMED2406 **Hormones, Kidney and Reproduction**	6	**P** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **N** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2805 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2912 or NUTR2911 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906	Semester 2
In addition, candidates may take Intermediate units of study from Table I for which they have satisfied the prerequisites. However, candidates are prohibited from taking the following units of study due to substantive overlap in content with the Intermediate core units of study: (i) intermediate units of study offered by the School of Medical Sciences (exceptions listed below); and (ii) IMMU2101; and (iii) BIOL2016/2916; BIOL2029/2929; MICR2021/2921; MICR2022/2922; MICR2024; BCHM2072/2972 Exceptions - The following intermediate units offered by the School of Life and Environmental Sciences and the School of Medical Sciences are permissible:			
ANAT2009 **Comparative Primate Anatomy**	6	**A** BIOL1XX3 OR BIOL1XX8 **N** ANAT2002	Semester 2
BCMB2002 **Proteins in Cells**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2902	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BCMB2902 **Proteins in Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2002	Semester 2
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
PCOL2012 **Pharmacology: Drugs and People**	6	**A** (BIOL1XXX or MBLG1XX1) and PCOL2011 **P** 6cp from CHEM1XXX **N** PCOL2555	Semester 2

C. Senior units of study

Candidates are required to take a minimum of 12 credit points of Senior units of study from the subject areas of: Anatomy, Applied Medical Science, Biology (Genetics) (i.e. BIOL3018/3918, BIOL3026/3926), Biochemistry, Cell Pathology, Histology, Immunology, Infectious Diseases, Microbiology, Neuroscience, Nutrition and Metabolism, Pharmacology, Physiology, Virology.

Note: INFD3012 is only available to students enrolled in the Bachelor of Medical Science degree and does not contribute to a major listed in Table I.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
INFD3012 **Infectious Diseases**	6	**P** BMED2401 and BMED2404 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

D. Majors

A complete list of available majors is set out in Table I. Of these, the majors available in medical science discipline areas are: Anatomy and Histology*, Applied Medical Science (Transitional Provision), Biochemistry*, Cell Pathology, Immunobiology*, Microbiology*, Molecular Biology and Genetics*, Neuroscience*, Nutrition and Metabolism, Pharmacology* and Physiology*.

* indicates a major in this area is also available at the advanced level

E. Study in other faculties

A total of 12 credit points of units of study from non-science discipline areas may be counted towards the Bachelor of Medical Science degree. Students should consult the handbooks from other faculties to determine any prerequisites, corequisites or other requirements relating to enrolment in units of study offered by departments in these faculties.

Note: Students may not enrol in BUSS1020, ECMT1010, ENVX1001, STAT1021, or any other unit of study deemed mutually exclusive with units of study listed in Table I.

F. Honours units of study

The units of study required to undertake Honours in the Bachelor of Medical Science degree are provided in Table I.

Note: Honours in the subject area of Infectious Diseases is only available to students enrolled in the the Bachelor of Medical Science degree. Its units are listed below. These Honours units of study designated as A, B, C, D should be taken in that order, whether a student enrols full-time, part-time or mid-year.

Infectious Diseases

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
INFD4011 **Infectious Diseases Honours A**	12	**N** BMED4021 *Note: Department permission required for enrolment*	Semester 1
INFD4012 **Infectious Diseases Honours B**	12	**C** INFD4011 **N** BMED4022	Semester 1
INFD4013 **Infectious Diseases Honours C**	12	**C** INFD4012 **N** BMED4023	Semester 2
INFD4014 **Infectious Diseases Honours D**	12	**C** INFD4013 **N** BMED4024	Semester 2

Bachelor of Medical Science

Unit of study descriptions

BMED2401
Cellular Foundations of Medical Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Suzanne Ollerenshaw **Session:** Semester 1 **Classes:** Two 1 hour lectures per week; 2-3 hours of practical or tutorial classes per week **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2910 or ANAT2011 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2029 or BIOL2929 OR BIOL2016 or BIOL2916 or BMED2801 or BMED2802 or BIOL2906 or IMMU2101 or MICR2021 or MICR2921 or MICR2022 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906 **Assessment:** One 2 hour theory exam (60%), four in-semester assessments (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Faculty of Science (with the cooperation of the Faculty of Medicine), Coordinated by the Discipline of Anatomy and Histology

This unit of study provides a basis for understanding cell structure and function, and response to drugs. It begins with a discussion of the characteristics of micro-organisms (bacteria, fungi and viruses) followed by the structure and function of human cells. Basic cell structure is examined by focussing on cell specialization and tissue organization in humans. The fundamentals of metabolism are introduced, in particular, the chemical reactions that are responsible for fuel processing. The molecular basis of drug action will then be discussed. Students will be introduced to the role of enzymes in the catalysis of cellular reactions and the pharmacological strategies employed to exploit our knowledge of these mechanisms. Intracellular signalling, cell to cell signalling, and pharmacological intervention in these processes are covered. To conclude this unit of study gives an introduction into embryology and how gene expression is regulated during development. Practical classes not only complement the lecture material but also introduce students to a wide range of technical skills. In addition, the sessions are designed to provide students with generic skills such as record keeping, data collection and presentation, protocol planning and written communication.

Textbooks

Histology: Histology- a text and atlas- Ross and Pawlina, 6th Edition;
Biochemistry Biochemistry- Garret RH and Grisham CM, Thompson Brooks Cole, 5th Edition, 2009;
Microbiology Prescott's Microbiology- Willey JM, Sherwood LM and Woolverton CJ, McGraw-Hill, 8th Edition, 2010;
Pharmacology Medical Pharmacology at a Glance- Neal MJ, Blackwell Science, 6th Edition , 2009.

BMED2402
Nerve and Muscle

Credit points: 6 **Teacher/Coordinator:** Dr Tina Hinton **Session:** Semester 1 **Classes:** 2 lectures and 2-4 hrs prac/tut per week. **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2806 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906 **Assessment:** One 2hr theory exam (60%), two in-semester assessments (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study begins with a description and analysis of the basic anatomical organization of the musculoskeletal and nervous (central and peripheral) systems. The structure and function of excitable cells, muscle and nerve, will lead to a discussion of membrane potential, synaptic transmission and neuromuscular junction. After consideration of the mechanisms of contraction, the way in which nerve signals are integrated and coordinated are covered in more detail. The receptors involved in normal modes of communications are discussed, This is complemented by an introduction to nervous system pharmacology, focusing on the autonomic nervous system and central nervous system, with special reference to pain and analgesia. An appreciation is gained of how toxins and infections can disturb normal neuromuscular coordination and nervous system function. Thus, pharmacological and pathological considerations are studied with relevance to the anatomical, histological and physiological concepts. Special senses such as vision and hearing are also introduced. In practical classes, students perform experiments to illustrate the functioning of motor control, coordination and the senses. In addition, students extend their anatomical and histological expertise by examining prosections and prepared microscope slides. Practical classes also include the effects of analgesics on experimental pain and case studies of tetanus and botulism. Sessions are also designed to nurture experimental design, hypothesis testing and data analysis skills.

Textbooks

Human Physiology: An integrated approach Silverthorn D Pearson/Benjamin Cummings, 6th Edition, 2013; The Anatomy Coloring Book Kapit W and Elson LM Benjamin Cummings, 4th Edition, 2015; Gray's Anatomy for Students Drake RL, Vogl W and Mitchell AWM Elsevier, 3rd Edition 2014; Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 9th Edition, 2014; Histology: A text and Atlas Ross MH and Pawlina W Lippincott, Williams and Wilkins, 7th Edition, 2015; Medical Pharmacology at a Glance Neal MJ Blackwell Science, 7th Edition, 2012; Rang and Dale's Pharmacology Rang HP, Dale MM, Ritter JM, Flower RJ and Henderson G Churchill Livingstone, 8th Edition, 2015; Robbins Basic Pathology Kumar V, Abbass AK and Aster J Elseview/Saunders, Philadelphia, 9th Edition, 2013.

BMED2403
Cardiovascular and Respiratory Systems

Credit points: 6 **Teacher/Coordinator:** Dr Sharon Herkes **Session:** Semester 1 **Classes:** 2 lec, 1 tut/prac per week **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2910 or ANAT2011 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2803 or IMMU2101 or MICR2021 or MICR2921 or MICR2022 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906 **Assessment:** One 2hr theory exam (60%), two in-semester assessments (40%) **Practical field work:** One prac per week **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study focuses on the cardiovascular and respiratory systems and the many processes responsible for the maintenance of homeostasis in the human body. The structure and function of the cardiovascular system is discussed and cardiac output, blood pressure and blood flow are studied. This is complemented by discussion of cardiovascular pathology and pharmacological intervention. Discussion of the respiratory system includes the structure of the respiratory organs, the mechanics of breathing, control of respiration, and description of the mechanism of gas exchange. Specifically, the actions of drugs for asthma are discussed and the pathology of obstructive versus restrictive airways disease examined. The unit of study then extends the students learning to pathogenic microbes involved in infectious diseases of the respiratory system. Practical classes are designed to nurture the same generic attributes taught in BMED2401 and BMED2402, and students are additionally introduced to a further range of technical skills.

Textbooks

Human Physiology: An integrated approach Silverthorn D Pearson/Benjamin Cummings, 6th Edition, 2013; The Anatomy Coloring Book Kapit W and Elson LM Benjamin Cummings, 4th Edition, 2015; Gray's Anatomy for Students Drake RL, Vogl W and Mitchell AWM Elsevier, 3rd Edition 2014; Histology: A text and Atlas Ross MH and Pawlina W Lippincott, Williams and Wilkins, 7th Edition, 2015; Medical Pharmacology at a Glance Neal MJ Blackwell Science, 7th Edition, 2012; Rang and Dale's Pharmacology Rang HP, Dale MM, Ritter JM, Flower RJ and Henderson G Churchill Livingstone, 8th Edition, 2015.

BMED2404
Microbes, Infection and Immunity

Credit points: 6 **Teacher/Coordinator:** Dr Jim Manos **Session:** Semester 2 **Classes:** Two lectures and one practical per week, two tutorials **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), in-semester assessments (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study begins by introducing the concepts of disease transmission, pathogenicity and virulence mechanisms of microbes. For a full understanding of the process of infection, the structure and function of pathogenic microorganisms is examined. How the body deals with injury and infection is discussed by exploring barriers to infection and host response once those barriers are breached. The body's response to such physical damage is dealt with in a series of lectures on wound healing, clotting and inflammation, and is complemented by discussion of the pharmacological basis of anti-inflammatory drugs. This is followed by a comprehensive discussion of molecular and cellular immune responses to pathogen invasion. In particular, this gives students an appreciation of the processing of antigens, the structure, production and diversity of antibodies, the operation of the complement system and mechanisms for recognition and destruction of invading microbes. The unit concludes with an overview of microbial diseases, the characteristics of causative agents, pathogenesis and symptoms as well as treatment and control and culminates with exploring current issues of antibiotic resistance, important emerging infections and vaccination strategies.

Practical classes illustrate and underpin the lecture content. Students will investigate normal flora, host defences and medically important microbes and will obtain experience in, and an understanding of, a range of techniques in bacteriology. In these practical sessions experience will be gained handling live, potentially pathogenic microbes.

Textbooks

Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
Basic Immunology: Functions and Disorders of the Immune System. Abass AK and Lichtman AH WB Saunders, 4th Edition, 2013
Robbins Basic Pathology Kumar V, Abbas AK and Aster J Saunders, Philadelphia, 9th Edition, 2013

BMED2405
Gut and Nutrient Metabolism

Credit points: 6 **Teacher/Coordinator:** A/Prof Charles Collyer **Session:** Semester 2 **Classes:** Two lectures and one tutorial or one practical session per week **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2807 or BMED2904 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2911 or NUTR2912 or PCOL2011 **Assessment:** One 2-hour theory exam (60%), five in-semester assignments/assessments (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines in detail the anatomy of the gastrointestinal tract, from the oral cavity to anal canal, and includes the liver, gallbladder and pancreas. This is complemented by description of the specialised cells in the gastrointestinal tract, followed by discussion of the transport mechanisms employed to absorb nutrients, and consideration of control systems used to regulate activity of the digestive process. The role of intestinal microflora in the gastrointestinal tract, contributing to both beneficial digestion and absorption of nutrients, as well as to pathogenic disruption, is also discussed. The fate of the macronutrients (carbohydrate, fat and protein) is then considered in terms of their uptake, disposal and reassembly into storage fuels and cellular structures. The biochemical pathways involved in the extraction of energy from the macronutrient fuels are then covered. Examples of these metabolic processes are provided by considering fuel selection during starvation and in diabetes. Finally, pharmacokinetics and pharmacogenomics are explored, with discussion of the metabolism and absorption of drugs including detoxification and excretion of xenobiotic compounds. Practical classes give students extensive experience with inspection of the gastrointestinal system at both the cellular and gross anatomical levels, and in theassay of biochemicals such as glucose. These sessions are designed to nurture observation, data analysis, record keeping and report writing skills.

Textbooks

Human Physiology: An integrated approach Silverthorn D Pearson/Benjamin Cummings, 6th Edition, 2013
Prescott's Microbiology Willey JM, Sherwood LM and Woolverton CJ McGraw-Hill, 10th Edition, 2016
The Anatomy Coloring Book Kapit W and Elson LM Benjamin Cummings, 4th Edition, 2014
Histology: A text and Atlas Ross MH and Pawlina W Lippincott, Williams and Wilkins, 7th Edition, 2015
Medical Pharmacology at a Glance Neal MJ Blackwell Science, 7th Edition, 2012
Textbook of Biochemistry with Clinical Correlations Devlin TM John Wiley and Sons Inc., 7th Edition, 2011

BMED2406
Hormones, Kidney and Reproduction

Credit points: 6 **Teacher/Coordinator:** Dr Melissa Cameron **Session:** Semester 2 **Classes:** 2 lec, 1 tut **Prerequisites:** 30 credit points from [12cp from CHEM1XXX and 12cp from MATH1XXX and 12cp from (BIOL1XXX, MBLG1XXX)] **Prohibitions:** ANAT2008 or ANAT2010 or ANAT2011 or ANAT2910 or BCHM2072 or BCHM2972 or BIOL2006 or BIOL2016 or BIOL2906 or BIOL2916 or BMED2805 or IMMU2101 or MICR2021 or MICR2022 or MICR2921 or MICR2922 or NUTR2912 or NUTR2911 or PCOL2011 or PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906 **Assessment:** One 2hr theory exam (60%), two in-semester assessments (40%) **Practical field work:** One prac per week **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines hormonal regulation of human body functions, including metabolism, growth and development, tissue function, and mood. Specifically, students will investigate the structure and function of endocrine glands, such as the pituitary, adrenal, thyroid and pancreas, at the cellular and gross anatomical level. The fundamentals of the feedback systems which are mediated via the hypothalamus and pituitary gland are discussed, in particular, the adrenal, gonadal and thyroid axes. Students will then cover the structure and function of the renal system at both the cellular and gross anatomical level. The fundamental homeostatic processes of the kidney, such as electrolyte, water and acid-base regulation of extracellular fluid, are explored. This unit of study also gives an introduction to the reproductive system, at both the anatomical and histological levels. The hormones involved in reproduction, contraception, fertilization and pregnancy are discussed, leading on to an overview of pharmacological interventions in contraception. In the practical classes, students will investigate the structure and function of the endocrine glands, will perform a glucose tolerance test to investigate how glucose levels are regulated, and will undertake investigation of the effects of diuretics. In addition, sessions are designed to nurture oral presentation skills, hypothesis testing and data analysis.

Textbooks

Textbook of Biochemistry with Clinical Correlations Devlin TM John Wiley and Sons Inc., 7th Edition, 2011; The Anatomy Coloring Book Kapit W and Elson LM Benjamin Cummings, 4th Edition, 2015; Gray's Anatomy for Students Drake RL, Vogl W and Mitchell AWM Elsevier, 3rd Edition 2014; Histology: A text and Atlas Ross MH and Pawlina W Lippincott, Williams and Wilkins, 7th Edition, 2015; Human Physiology: An Integrated Approach Silverthorn D Pearson/Benjamin Cummings, 6th Edition, 2013; Medical Pharmacology at a Glance Neal MJ Blackwell Science, 7th Edition, 2012; Rang and Dale's Pharmacology Rang HP, Dale MM, Ritter JM, Flower RJ and Henderson G Churchill Livingstone, 8th Edition, 2015.

INFD3012
Infectious Diseases

Credit points: 6 **Teacher/Coordinator:** A/Prof Jamie Triccas **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 4 hour practical class per week. **Prerequisites:** BMED2401 and BMED2404 **Assessment:** Formal examination (60%): one 2 hour exam. Progressive assessment (40%): includes tutorial case presentation, mid-semester quiz and practical assessment. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Infectious diseases occur as a result of interactions between a host and a microbial parasite. This unit of study will explain how infectious agents interact with human hosts at the molecular, cellular, individual patient and community levels to cause diseases and how the hosts attempt to combat these infections. The unit will be taught by the discipline of Infectious Diseases and Immunology of the Department of Medicine within the Central Clinical School, Faculty of Medicine with involvement of associated clinical and research experts who will contribute lectures and theme sessions on their own special interests. The unit will integrate lectures with clinical case studies and hands-on practical sessions to provide students with current knowledge of infectious diseases.

Textbooks

Infectious Diseases: Pathogenesis, Prevention and Case Studies. Edited by Shetty et al. Wiley-Blackwell 2009. ISBN 9781405135436.

Bachelor of Medical Science / Doctor of Medicine

Please note:

The following course resolution is published subject to approval by the Academic Board on 28 November 2017.

Bachelor of Medical Science/Doctor of Medicine

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BPMSCMED-01	Bachelor of Medical Science/Doctor of Medicine

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Cross faculty management

(1) Candidates in this double degree will be under the general supervision of the Faculty of Science until the end of the semester in which they complete the requirements for the Bachelor of Medical Science. After that they will be under the general supervision of the Faculty of Medicine (Sydney Medical School).

(2) The Deans of the Faculties of Medicine and Science shall jointly exercise authority in any matter concerned with the double degree program not otherwise dealt with in these resolutions.

4 Admission to candidature

(1) Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents) leading to the award of an Australian Tertiary Admission Ranking (ATAR) or equivalent. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Applicants are ranked by merit and offers for available places are issued according to the ranking. Eligible Indigenous or Torres Strait Islander applicants who submit additional information may improve their ranking by participating in the University's access and equity schemes. Details of admission policies are found in the Coursework Rule.

(2) In addition, admission to this course requires the applicant to participate in a semi structured interview. The results of this interview will form part of the ranking of applicants.

(3) The Dean may also admit to the Bachelor of Medical Science/Doctor of Medicine students who:

(a) are candidates for the Bachelor of Medical Science/Bachelor of Medicine and Bachelor of Surgery;

(b) did not commence the Bachelor of Medicine and Bachelor of Surgery prior to 1 January 2014; and

(c) have formally elected to proceed under these resolutions.

5 Requirements for award

(1) The units of study that may be taken for the course are set out in:

(a) Table IV for the Bachelor of Medical Science in the Faculty of Science handbook; and

(b) the table of units of study for the Doctor of Medicine from the Faculty of Medicine.

(2) The Dean of the Faculty of Science may permit a candidate of exceptional merit who is admitted to the Talented Student Program to undertake a unit or units of study within the Faculty other than those specified in Table IV.

(3) To qualify for the award of award of both degrees a candidate must successfully complete 336 credit points, comprising:

(a) 144 credit points to qualify for the award of the Bachelor of Medical Science as required in the Bachelor of Medical Science resolutions; and

(b) 192 credit points to qualify for the award of the Doctor of Medicine as required by the resolutions for the Doctor of Medicine; and

(c) One zero credit point Medicine unit of study in the first three years of the program.

6 Progression rules

(1) Candidates must complete all requirements for the degree Bachelor of Medical Science within three years (or four years with honours), excluding any authorised periods of suspension, and must maintain a credit average in each year of the Bachelor of Medical Science, this being the minimum achievement required for admission to candidature for the Doctor of Medicine.

(2) Failure to maintain required progression and minimum result requirements will result in candidates being transferred from the double degree program to the Bachelor of Medical Science with full credit for the units of study completed.

7 Requirements for the Honours degree

(1) Honours is available to meritorious candidates in the Bachelor of Medical Science.

(2) Honours in the Bachelor of Medical Science requires completion of an additional year of full time study. Candidates must complete the requirements for the honours course full-time over two consecutive semesters.

(3) Candidates who enrol in the honours year at the completion of the Bachelor of Medical Science will suspend enrolment in the double degree and transfer to the Bachelor of Medical Science honours candidature and enrol in fourth year units of study, before returning to complete the double degree award. Honours can also be attempted at the completion of the double degree program.

(4) Admission and award requirements for honours are described in the resolutions of the Faculty of Science.

8 Award of the degree

(1) The Bachelor of Medical Science is awarded as either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Third Class according to the rules specified in the resolutions of the Faculty of Science.

(2) Candidates for the award of an Honours degree who do not meet the requirements, and who have not already graduated, will be awarded the relevant pass degree.

(3) The Doctor of Medicine is awarded as a Pass grade.

9 Credit Transfer

It is not possible for candidates enrolled in the Bachelor of Medical Science/Doctor of Medicine to obtain credit for previous studies, except where approved by the Dean of Medicine for the purposes of subclause 4(3).

10 Course transfer

A candidate may abandon the double degree program and elect to complete the Bachelor of Medical Science in accordance with the resolutions governing that degree. Completion of the Doctor of Medicine in the future will require a new application for admission to candidature for that course and completion in accordance with the resolutions governing that degree.

11 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January 2016.

(2) These resolutions also apply to students who have been admitted to the degree in accordance with subclause 4(3).

(3) Students who commenced their degree prior to 1 January 2018 or who progress according to degree resolutions applicable to students commencing before that date may take major/s from the major/s listed under 'Transitional Provisions' in Table 1.

Bachelor of Science (pre-2018)

Bachelor of Science

Bachelor of Science (Honours)

Bachelor of Science (Advanced)

Bachelor of Science (Advanced Mathematics)

These resolutions must be read in conjunction with the applicable University By-Laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014 ('the Coursework Policy'), the Learning and Teaching Policy 2015, the Resolutions of the Faculty of Science, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title	Stream title
BPSCIENC-02	Bachelor of Science	Bachelor of Science (Advanced), Bachelor of Science (Advanced Mathematics)
BHSCIENH-02	Bachelor of Science (Honours)	Bachelor of Science (Advanced) (Honours), Bachelor of Science (Advanced Mathematics) (Honours)

2 Attendance pattern

The attendance pattern for this course is full time or part time according to candidate choice.

3 Streams

(1) The Bachelor of Science is available in the following streams:
(a) Advanced
(b) Advanced Mathematics
(2) Students will apply for, and be enrolled in, either the Bachelor of Science or one of its streams. Students, who have completed at least 48 credit points, may be permitted to transfer to either the Bachelor of Science (Advanced) or (Advanced Mathematics) stream from the Bachelor of Science if they:
(a) achieved an average mark of 75 or greater over all units of study attempted; and
(b) are able to enrol in the required number of Advanced level units or Talented Student Program (TSP) units.
(3) Students wishing to transfer between streams should contact the Student Centre.

4 Admission to candidature

Admission to undergraduate courses at the University of Sydney is competitive on the basis of completion of secondary study via the NSW Higher School Certificate, leading to the award of an Australian Tertiary Admission Ranking (ATAR) or equivalent (and subject to special admissions provisions as set out in the Coursework Policy), or on the basis of Mature Age Admission as set out in the Admissions section of the Coursework Policy.

5 Requirements for award

(1) The Dean may permit a student of exceptional merit who is admitted to the Talented Student Program to undertake a unit or units of study within the Faculty other than those specified in the tables.
(2) The units of study that may be taken for the Bachelor of Science, Bachelor of Science (Advanced) and Bachelor of Science (Advanced Mathematics) are listed in Table 1.
(3) *Bachelor of Science*
(a) To qualify for the award of the Bachelor of Science, a student must successfully complete 144 credit points, comprising:
(I) a major from Science subject areas listed in Table 1; and
(II) a minimum of 12 credit points from the Science subject areas of Mathematics and Statistics; and
(III) a minimum of 24 credit points of Junior units of study from at least two Science subject areas other than Mathematics and Statistics;
(b) and ensure:
(I) a minimum of 96 credit points from Science subject areas listed in Table 1; and
(II) no more than 60 credit points from junior units of study; and
(III) no more than 48 credit points from units of study not listed in Table 1, with the approval of the relevant faculty.
(4) *Bachelor of Science (Advanced)*
To qualify for the award of the Bachelor of Science (Advanced) stream, a student must successfully complete 144 credit points specified in the Bachelor of Science above, include no more than 48 credit points from junior units of study, and ensure:
(I) a minimum of 12 credit points of intermediate units of study at either the advanced level or as Talented Student Program (TSP) units in Science subject areas; and
(II) a minimum of 48 credit points of senior units of study of which at least 24 credit points are completed at the advanced level or as TSP units in a single Science subject area.
(5) *Bachelor of Science (Advanced Mathematics)*
To qualify for the award of the Bachelor of Science (Advanced Mathematics) stream, a student must successfully complete 144 credit points specified in the Bachelor of Science above, include no more than 48 credit points from junior units of study, and ensure:

(I) a minimum of 12 credit points of intermediate units of study at either the advanced level or as TSP units in the Science subject areas of Mathematics and Statistics; and
(II) a major in Mathematics, Statistics or Financial Mathematics and Statistics; and
(III) at least 48 credit points of senior units of study of which at least 24 credit points are completed at the advanced level or as TSP units in the Science subject areas of Mathematics and Statistics.

6 Majors

(1) Completion of a major is a requirement of the Bachelor of Science, Bachelor of Science (Advanced) and Bachelor of Science (Advanced Mathematics). Students have the option of completing up to two majors, one of which must be a major from Science subject areas listed in Table 1. For their second major, students may complete another major from Science subject areas listed in Table 1 or a major from cross-disciplinary subject areas listed in Table 2.
(2) A major requires the completion of 24 senior credit points chosen from units of study listed in the table for that major, except for a Psychology major. A Psychology major requires 48 credit points across Intermediate and Senior units of study as specified in Table 1. Units of study counted towards one major may not count toward any other major. The majors available are:
(3) The Table 1 majors available are:
(a) Anatomy and Histology *
(b) Applied Medical Science (Transitional Provision)
(c) Biochemistry *
(d) Bioinformatics
(e) Biology *
(f) Cell Pathology
(g) Chemistry *
(h) Computer Science *
(i) Environmental Studies *
(j) Financial Mathematics and Statistics *
(k) Geography *
(l) Geology & Geophysics *
(m) History and Philosophy of Science
(n) Immunobiology *
(o) Information Systems *
(p) Marine Science *
(q) Mathematics *
(r) Medicinal Chemistry *
(s) Microbiology *
(t) Molecular Biology and Genetics*
(u) Nanoscience and Technology *
(v) Neuroscience *
(w) Nutrition and Metabolism
(x) Pharmacology *
(y) Physics *
(z) Physiology *
(aa) Plant Science *
(bb) Psychology (additional requirements apply)
(cc) Soil Science
(dd) Statistics *

** indicates a major in this area is also available at the advanced level.*

(4) The Table 2 majors available are:
(a) Geoarcheology

7 Progression rules

(1) Candidates enrolled in the Bachelor of Science (Advanced) or Bachelor of Science (Advanced Mathematics) are required to maintain a minimum average mark of 65 in all intermediate and senior units of study in Science subject areas in each year of enrolment. Failure to maintain the required average will result in candidates being transferred to the Bachelor of Science in their next year of enrolment with full credit for the units of study completed.
(2) Candidates enrolled in the Bachelor of Science (Advanced) or Bachelor of Science (Advanced Mathematics) who fail to achieve an average mark of 65 across all Science units of study attempted in their final year but have otherwise completed all the requirements of the degree will be awarded the Bachelor of Science.
(3) Candidates enrolled in the Bachelor of Science (Molecular Biology and Genetics) who fail to maintain a minimum average mark of 65 in units of study in Science subject areas in each year of enrolment will be transferred to the Bachelor of Science.

8 Requirements for the Honours degree

(1) Honours is available to meritorious candidates who complete an additional year of full time study, after the completion of the pass degree. Candidates must complete the requirements for the honours course full-time over two consecutive semesters. If the School is satisfied that a student is unable to attempt honours course on a full time basis and if the Dean so recommends, permission may be granted to undertake honours part-time over four consecutive semesters.
(2) Admission, requirements and award of honours are according to the Coursework Policy 2014 and the Resolutions of the Faculty of Science.
(3) The honours subject areas and units of study for the Bachelor of Science (Honours) and Bachelor of Science (Advanced) (Honours) and Bachelor of Science (Advanced Mathematics) (Honours) are listed in Table VI.

9 Award of the degree

(1) The Bachelor of Science, Bachelor of Science (Advanced) and Bachelor of Science (Advanced Mathematics) are awarded as either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Third Class according to the rules specified in the Coursework Policy 2014 and the Resolutions of the Faculty of Science.
(2) Candidates for the award of the Honours degree who do not meet the requirements, and who have not already graduated, will be awarded the pass degree merited.

10 Transitional provisions

(1) These resolutions apply to persons who commenced their candidature after 1 January, 2015 and persons who commenced their candidature prior to 1 January, 2015 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2015 may complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that requirements are completed by 1 January, 2020, or later date as the Faculty may, in special circumstances, approve.

(3) Students who commenced their degree prior to 1 January 2018 or who progress according to degree resolutions applicable to students commencing before that date may take major/s from the major/s listed under 'Transitional Provisions' in Table 1.

Bachelor of Science (Advanced) / Doctor of Medicine (pre-2018)

Please note:

The following course resolution is published subject to approval by the Academic Board on 28 November 2017.

Bachelor of Science (Advanced)/Doctor of Medicine

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course and stream title
BPSCAMED-01	Bachelor of Science (Advanced)/Doctor of Medicine

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Cross faculty management

(1) Candidates in this double degree will be under the general supervision of the Faculty of Science until the end of the semester in which they complete the requirements for the Bachelor of Science (Advanced). They will then be under the supervision of the Faculty of Medicine (Sydney Medical School).

(2) The Deans of the Faculty of Science and the Faculty of Medicine shall jointly exercise authority in any matter concerned with the double degree course not otherwise dealt with in these resolutions.

4 Admission to candidature

(1) Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents) leading to the award of an Australian Tertiary Admission Ranking (ATAR) or equivalent. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Applicants are ranked by merit and offers for available places are issued according to the ranking. Eligible Indigenous or Torres Strait Islander applicants who submit additional information may improve their ranking by participating in the University's access and equity schemes. Details of admission policies are found in the Coursework Rule.

(2) In addition, admission to this course requires the applicant to participate in a semi structured interview. The results of this interview will form part of the ranking of applicants.

(3) The Dean may also admit to the Bachelor of Science (Advanced)/Doctor of Medicine students who:

(a) are candidates for the Bachelor of Science (Advanced)/Bachelor of Medicine and Bachelor of Surgery;

(b) did not commence the Bachelor of Medicine and Bachelor of Surgery prior to 1 January 2014; and

(c) have formally elected to proceed under these resolutions.

5 Requirements for award

(1) The units of study that may be taken for the course are set out in:

(a) Table 1 for the Bachelor of Science (Advanced) from the Faculty of Science; and

(b) The table of units of study for the Doctor of Medicine from the Faculty of Medicine.

(2) The Dean of the Faculty of Science may permit a candidate of exceptional merit who is admitted to the Talented Student Program (TSP) to undertake a unit or units of study within the Faculty other than those specified in Table 1.

(3) To qualify for the award of both degrees a candidate must successfully complete 336 credit points, comprising:

(a) 144 credit points to qualify for the award of the Bachelor of Science (Advanced) as required by the Bachelor of Science resolutions; and

(b) 192 credit points to qualify for the award of the Doctor of Medicine as required by the resolutions for the Doctor of Medicine; and

(c) one zero credit point Medicine unit of study in the first three years of the program.

6 Majors

(1) Completion of a major is a requirement of the Bachelor of Science (Advanced) in this double degree. Candidates have the option of completing up to two majors.

(2) The list of majors available in the Bachelor of Science (Advanced) is specified in the course resolutions for the Bachelor of Science.

7 Progression rules

(1) Candidates must complete all requirements for the degree Bachelor of Science (Advanced) within three years (or four years with honours), excluding any authorised periods of suspension, and must maintain a credit average in each year of the Bachelor of Science (Advanced), this being the minimum achievement required for admission to candidature for the Doctor of Medicine.

(2) Failure to maintain required progression and minimum result requirements will result in candidates being transferred from the double degree program to the Bachelor of Science (Advanced) or to the Bachelor of Science, determined by the Faculty of Science, according to the requirements of those degree resolutions at the point of transfer, with full credit for the units of study completed.

8 Requirements for the Honours degree

(1) Honours is available to meritorious candidates in the Bachelor of Science (Advanced).

(2) Honours in the Bachelor of Science (Advanced) requires completion of an additional year of full time study. Candidates must complete the requirements for the honours course full-time over two consecutive semesters.

(3) Candidates who enrol in the honours year at the completion of the Bachelor of Science (Advanced) will suspend enrolment in the double degree and transfer to the Bachelor of Science honours candidature and enrol in fourth year units of study, before returning to complete the double award. Honours can also be attempted at the completion of the double degree program.

(4) Admission and award requirements for honours in the Bachelor of Science (Advanced) are described in the resolutions of the Faculty of Science.

9 Award of the degree

(1) The Bachelor of Science (Advanced) is awarded as either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Third Class according to the conditions specified in the resolutions of the Faculty of Science.

(2) Candidates for the award of an Honours degree who do not meet the requirements, and who have not already graduated, will be awarded the relevant pass degree.

(3) The Doctor of Medicine is awarded as a Pass grade.

10 Credit Transfer

It is not possible for candidates enrolled in the Bachelor of Science (Advanced)/Doctor of Medicine to obtain credit for previous studies, except where approved by the Dean of Medicine for the purposes of subclause 4(3).

11 Course transfer

A candidate may abandon the double degree program and elect to complete the Bachelor of Science or the Bachelor of Science (Advanced) in accordance with the resolutions governing that degree. Completion of the Doctor of Medicine in the future will require a new application for admission to candidature for that course and completion in accordance with the resolutions governing that degree.

12 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January 2016.

(2) These resolutions also apply to students who have been admitted to the degree in accordance with subclause 4(3).

(3) Students who commenced their degree prior to 1 January 2018 or who progress according to degree resolutions applicable to students commencing before that date may take major/s from the major/s listed under 'Transitional Provisions' in Table 1.

Bachelor of Science / Bachelor of Arts (pre-2018)

Please note:

The following course resolution is published subject to approval by the Academic Board on 28 November 2017.

Bachelor of Science and Bachelor of Arts

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title	Stream title
BPSCIART-02	Bachelor of Science and Bachelor of Arts	Bachelor of Science (Advanced), Bachelor of Science (Advanced Mathematics)

2 Attendance pattern

The attendance pattern for this course is full time or part time according to candidate choice.

3 Streams

(1) The Bachelor of Science in this combined degree is also available in the following streams:
(a) Advanced
(b) Advanced Mathematics
(2) Students with a sufficient ATAR may choose to be admitted into either of the Advanced streams. All others will enter the Bachelor of Science without a stream. Students, who have completed at least 48 credit points, may be permitted to transfer to either the Bachelor of Science (Advanced) or (Advanced Mathematics) stream if they:
(a) achieved an average mark of 75 or greater over all units of study attempted; and
(b) are able to enrol in the required number of Advanced level units or Talented Student Program (TSP) units.
(3) Students wishing to transfer between streams should contact the Faculty student office.

4 Cross faculty management

(1) Candidates will be under the general supervision of the Faculty of Science for the duration of the combined program.
(2) The Deans of the Faculty of Science and the Faculty of Arts and Social Sciences shall jointly exercise authority in any matter concerned with the combined course not otherwise dealt with in these resolutions.

5 Admission to candidature

Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents), tertiary study or an approved preparation program. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for mature aged applicants who do not possess a school leaving qualification, educationally disadvantaged applicants and for Aboriginal and Torres Strait Islander people. Applicants are ranked by merit and offers for available places are issued according to the ranking. Details of admission policies are found in the Coursework Rule.

6 Requirements for award

(1) The units of study that may be taken for the course are set out under subject areas in Table 1 from the Faculty of Science and Table A from the Faculty of Arts and Social Sciences.
(2) The Dean may permit a candidate of exceptional merit who is admitted to the Faculty of Science Talented Student Program to undertake a unit or units of study within the Faculty of Science other than those specified in Table 1.
(3) To qualify for the award of the Bachelor of Science and Bachelor of Arts, a candidate must successfully complete 192 credit points, comprising:
(a) a minimum of 96 credit points from Science subject areas, including:
(I) a major from Science subject areas listed in Table 1; and
(II) a minimum of 12 credit points from the Science subject areas of Mathematics and Statistics; and
(III) a minimum of 24 credit points of Junior units of study from at least two Science subject areas other than Mathematics and Statistics.
(b) a minimum of 72 credit points of Senior units of study in Arts and Social Sciences subject areas from Table A, including:
(I) a major from Arts and Social Sciences subject areas listed in Table A; and
(II) ensuring no more than 60 credit points of Senior units of study from any one Arts and Social Sciences subject area.
(c) no more than 18 credit points of Junior units of study from any one Arts and Social Sciences subject area; and
(d) no more than 12 credit points from units of study not listed in Science Table 1 or Arts Table A with the approval of the relevant faculty.
(4) Candidates completing the Advanced stream must include as part of the above requirements:
(a) a minimum of 12 credit points of intermediate units of study at either the Advanced level or as Talented Student Program (TSP) units in Science subject areas; and
(b) a minimum of 24 credit points of senior units of study at the Advanced level or as TSP units in a single Science subject area.
(5) Candidates completing the Advanced Mathematics stream must include as part of the above requirements:
(a) a minimum of 12 credit points of intermediate units of study at either the advanced level or as TSP units in the Science subject areas of Mathematics and Statistics; and
(b) a minimum of 24 credit points of Senior units of study at the Advanced level or as TSP units in a major in Mathematics, Statistics or Financial Mathematics and Statistics.

7 Majors

(1) Completion of a major in each degree is a requirement of the course. Units of study counted towards one major may not count toward any other major completed.
(2) The list of majors available in the Bachelor of Science is specified in the course Resolutions for the Bachelor of Science.
(3) The list of majors available in the Bachelor of Arts are listed in the resolution of the Faculty of Arts and Social Sciences.

8 Progression rules

(1) A candidate may proceed concurrently to the degrees of Bachelor of Science, Bachelor of Science (Advanced), Bachelor of Science (Advanced Mathematics) and Bachelor of Arts.
(2) Candidates enrolled in the Bachelor of Science (Advanced) or Bachelor of Science (Advanced Mathematics) are required to maintain a minimum average mark of 65 in all intermediate and senior units of study in Science subject areas in each year of enrolment. Failure to maintain the required average will result in candidates being transferred to the Bachelor of Science in their next year of enrolment with full credit for the units of study completed.
(3) Candidates enrolled in the Bachelor of Science (Advanced) or Bachelor of Science (Advanced Mathematics) who fail to achieve an average mark of 65 across all Science units of study attempted in their final year but have otherwise completed all the requirements of the degree will be awarded the Bachelor of Science.

9 Requirements for the Honours degree

(1) Honours is available to meritorious candidates, in either or both the Bachelor of Science or Bachelor of Arts. Honours requires the completion of one additional full time year of study for each honours degree attempted. Candidates must complete the requirements for the honours course full-time over two consecutive semesters. If the School or Department is satisfied that a student is unable to attempt the honours course on a full time basis and if the Dean so recommends, permission may be granted to undertake honours part-time over four consecutive semesters.
(2) Candidates who enrol in the honours year during the program will suspend enrolment in the combined degree and transfer to the single Bachelor of Arts or Bachelor of Science honours candidature and enrol in fourth year units of study, before returning to complete the combined award. Honours can also be attempted at the completion of the pass program.
(3) Admission and award requirements for honours in the Bachelor of Science are listed in the resolutions of the Faculty of Science. Admission and award requirements for honours in the Bachelor of Arts are listed in the resolutions of the Faculty of Arts and Social Sciences.

10 Award of the degree

(1) Candidates will be awarded a separate testamur for each degree completed.
(2) The Bachelor of Science and Bachelor of Arts are awarded as either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Third Class according to the rules specified in the Resolutions of the Faculty of Science and Faculty of Arts and Social Sciences.
(3) Candidates for the award of the Honours degree who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

11 Course transfer

A candidate may abandon the combined program and elect to complete the either the Bachelor of Arts or the Bachelor of Science in accordance with the resolutions governing that degree. Completion of the abandoned degree in the future will require a new application for admission to that course and completion in accordance with the resolutions governing that degree.

12 Transitional provisions

(1) These resolutions apply to candidates who commenced their candidature after 1 January, 2016 and candidates who commenced their candidature prior to 1 January, 2016 who elect to proceed under these resolutions.
(2) Candidates who commenced prior to 1 January, 2016 may complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that the requirements are completed by 1 January, 2021. The Faculty may specify a later date for completion or specify alternative requirements for completion of candidatures that extend beyond this time.
(3) Students who commenced their degree prior to 1 January 2018 or who progress according to degree resolutions applicable to students commencing before that date may take major/s from the major/s listed under 'Transitional Provisions' in Table 1.

Bachelor of Science in Agriculture (pre-2018)

Bachelor of Science in Agriculture

Bachelor of Science in Agriculture (Honours)

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course title
BUSCAGRI-01	Bachelor of Science in Agriculture

2 Attendance pattern

The attendance pattern for this course is full time or part time according to candidate choice.

3 Admission to candidature

Admission to this course is on the basis of a secondary school leaving qualification such as the NSW Higher School Certificate (including national and international equivalents), tertiary study or an approved preparation program. English language requirements must be met where these are not demonstrated by sufficient qualifications taught in English. Special admission pathways are open for mature aged applicants who do not possess a school leaving qualification, educationally disadvantaged applicants and for Aboriginal and Torres Strait Islander people. Applicants are ranked by merit and offers for available places are issued according to the ranking. Details of admission policies are found in the Coursework Rule.

4 Requirements for award

(1) The units of study that may be taken for the course are set out in table of units of study for the Bachelor of Science in Agriculture. The Dean may approve some variation in units of study required for the degree for exceptionally talented students.
(2) To qualify for the award of the pass degree, a candidate must successfully complete 192 credit points, including:
(a) 150 credit points of core units of study; and
(b) In addition, at least 12, and no more than 18 credit points from units designated as Year 4 specialisation units; and
(c) The remaining units from units designated as Year 3 or Year 4 electives.
(d) A maximum of 12 credit points from the year 3 electives (at 2000 level units or higher) may be taken from outside Table D
(e) and 6 credit points from the year 4 electives (at 3000+ level units), may be taken from outside Table D, E and F.
(3) To qualify for the award of international specialisation, a candidate must complete a minimum of 48 credit points in approved units of study for two semesters at an approved university. Once a student has applied for and been accepted for International Exchange, the student may then apply for the International Specialisation. For detailed information on the application procedure, requirements and approved universities, please see the Student Centre.

5 Award of the degree

(0) The Bachelor of Science in Agriculture is awarded as either Pass or with Honours. Honours are awarded in classes ranging from First Class to Second Class.

6 Weighted average mark (WAM)

(1) The University has a formula for calculating a Weighted Average Mark and this is defined in the University Glossary. WAMs are used by the University as one indicator of performance. For example, WAMs can be used in assessing admission to and award of honours, eligibility for prizes and scholarships, or assessing progression through a course.
(2) For the Bachelor of Science in Agriculture, the Faculty of Agriculture and Environment uses a Year 2/3 WAM that includes all 2000 level and 3000 level units of study, except those 3000 level units of study taken to fulfil part of the requirements for Year 4. For the BScAgr, the Year 4 WAM includes all 4000 level units of study as well as any 3000 level unit of study taken to fulfil part of the requirements for Year 4.
(3) The WAM calculations use the following formula:

$$\text{WAM} = \frac{\text{sum}(Wc \times Mc)}{\text{sum}(Wc)}$$

where Wc is the unit of study credit points x the unit weighting and Mc is the mark achieved for the unit. The mark used for units with a grade AF is zero. Pass/fail units and credited units from other institutions are not counted. All units carry a weighting of one, except the individual research components of undergraduate degrees, which carry a weighting of two.

7 Award of the degree of Bachelor with Honours

(0) For the degree of Bachelor of Science in Agriculture
(1) To qualify for the award of honours a student must normally:
(a) have a Year 2/3 WAM of at least 65; and
(b) complete an independent research component as part of the final year of the program with an overall honours mark of at least 65.
(2) The overall honours mark shall be the average of the Year 2/3 WAM and the Year 4 WAM.
(3) Honours is awarded in the following classes:

Level of honours	Overall honours mark	Minimum WAM Years 2/3
First Class	mark >= 75	65
Second Class, Division 1	70 <= mark < 75	65
Second Class, Division 2	65 <= mark < 70	65
Honours not awarded	mark <65	n/a

8 Transitional provisions

(1) These resolutions apply to persons who commenced their candidature after 1 January, 2013 and persons who commenced their candidature prior to 1 January, 2013 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2013 may complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that requirements are completed by 1 January, 2018. The Faculty may specify a later date for completion or specify alternative requirements for completion of candidatures that extend beyond this time.

Bachelor of Science in Agriculture

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Year 1			
Year 1 will have the following 48 credit point structure:			
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
or			
GEOS1901 **Earth, Environment and Society Advanced**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 *Note: Department permission required for enrolment*	Semester 1
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
or			
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
or			
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
or			
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
or			
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
or			
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
ENVX1002 **Introduction to Statistical Methods**	6	**N** ENVX1001 *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
ENVI1003 **Global Challenges: Food, Water, Climate**	6		Semester 2
AGEC1006 **Economic Environment of Agriculture**	6	**A** HSC Mathematics **N** AGEC1003 or AGEC1004	Semester 2
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
or			
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
or			

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
CHEM1012 **Fundamentals of Chemistry 1B**	6	**P** CHEM1XX1 **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992	Semester 2
or			
CHEM1112 **Chemistry 1B**	6	**P** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992	Semester 1 Semester 2
or			
CHEM1912 **Chemistry 1B (Advanced)**	6	**P** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 *Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.*	Semester 2
or			
CHEM1992 **Chemistry 1B (Special Studies Program)**	6	**P** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 *Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.*	Semester 2
Year 2			
Year 2 will have the following 48 credit point structure:			
ENVX2001 **Applied Statistical Methods**	6	**P** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] *Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams*	Semester 1
MICR2031 **Microbiology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **N** MICR2021 or MICR2921 or MICR2024 or MICR2931	Semester 1
or			
MICR2931 **Microbiology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **P** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2021 or MICR2921 or MICR2024 or MICR2031	Semester 1
AGEN2001 **Plant Function**	6	**P** 6cp from (BIOL1XXX or AGEN1004) and 12cp from (CHEM1XX1 or CHEM1XX2 or AGEN1006) **N** PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906	Semester 1
SOIL2005 **Soil and Water: Earth's Life Support Systems**	6	**N** SOIL2003 or LWSC2002	Semester 1
AGEN2006 **Animal Production and Management**	6	**A** HSC level Mathematics and Biology **P** 12cp from (BIOL1XXX, AGEN1004) and 12cp from (CHEM1XX1, CHEM1XX2, AGEN1006) **N** AVBS1002	Semester 2
BIOL2031 **Plants and Environment**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **N** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2931	Semester 2
or			
BIOL2931 **Plants and Environment (Advanced)**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **P** Annual average mark of at least 70 in previous year **N** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2031	Semester 2
BIOL2033 **Entomology**	6	**N** ENTO2001	Semester 2
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
or			
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
GEGE2X01 is intended to be taken in semester 2			
Year 3*			
Year 3 will have the following structure: a core (24 credit points) of			
AGCH3025 **Chemistry and Biochemistry of Foods**	6	**A** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **N** AFNR5102 or AGCH3017 or AGCH3024	Semester 1
PPAT3003 **Plant Health and Disease**	6	**P** 6 credit points of Microbiology units	Semester 1
AGRO3004 **Managing Agro-Ecosystems**	6	**P** (BIOL2023 or BIOL2923 or PLNT2003 or AGEN2001) and (SOIL2003 or SOIL2005)	Semester 2
SOIL2004 **The Soil Resource**	6		Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
And 24 credit points from Table D.			
Table D - Year 3 Electives			
AFNR3001 **Agro-ecosystems in Developing Countries**	6	*Note: Department permission required for enrolment*	Semester 1
ANSC3102 **Animal Reproduction**	6	**A** ANSC3104	Semester 1
ANSC3103 **Animal Structure and Function A**	6	**A** AVBS1002 **P** 12cp from (BIOL1XXX, VETS1032, AGEN2001)	Semester 1
AREC2001 **Econ of Biological Production Systems**	6	**P** ECON1001 or AGEC1006 or AGEC1102	Semester 1
AREC2003 **Concepts in Enviro and Resource Economics**	6	**P** ECON1001 or ECON1040 or AREC1006 or AGEC1102	Semester 1
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1
Special Permission required for enrolment			
or			
BIOL3918 **Gene Technology and Genomics (Adv)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **N** BIOL3018	Semester 1
Special Permission required for enrolment			
ECMT2150 **Intermediate Econometrics**	6	**P** (ECMT1010 or BUSS1020 or MATH1905 or MATH1005 or MATH1015) and ECMT1020 **N** ECMT2110	Semester 1 Semester 2
ENVX3002 **Statistics in the Natural Sciences**	6	**P** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 *Interdisciplinary Unit*	Semester 1
HORT3005 **Production Horticulture**	6	**P** (AGEN2001 and AGEN2005) or BIOL2X30 or BIOL2X31 or BIOL2X23 or AGEN2002 or AGRI2001	Semester 1
ENSC2001 **Environmental Monitoring**	6	**A** Understanding of scientific principles and concepts including biodiversity, human impacts on the environment, properties of substances (e.g., acidity, alkalinity, solvents) and basic knowledge of statistics. **N** AGCH3033	Semester 1
ANSC3101 **Animal Nutrition 3**	6	**A** Fundamentals of Biochemistry **P** AVBS2001 and [VETS1032 or AGEN2001 or (MICR2X31 or MICR2024)] **C** AVBS2001 and MICR2X31	Semester 2
ANSC3104 **Animal Structure and Function B**	6	**P** ANSC3103	Semester 2
AREC2002 **Commodity Market and Price Analysis**	6	**P** ECON1001 or AGEC1006 or AGEC1102	Semester 2
AREC2004 **Benefit-Cost Analysis**	6	**P** ECON1001 or AGEC1006 or AGEC1102	Semester 2
AREC3001 **Production Modelling and Management**	6	**P** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901	Semester 2
ENVX3001 **Environmental GIS**	6	**P** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX	Semester 2
Year 4^			
Year 4 students will complete:			
AFNR4101 **Research Project A**	12	**P** 144 credit points of level 1000-3000 units of study	Semester 1
AFNR4001 **Professional Development**	6	**N** AGRF4000 *Note: Department permission required for enrolment*	Semester 2
AFNR4102 **Research Project B**	12	**P** AFNR4101	Semester 2
Year 4 students will complete one specialisation comprising two 6cp units of study (from Table E) and up to one elective unit from Table D, E or F.			
^ A student may apply to the degree coordinator for permission to enrol in up to one (6 cp) elective University of Sydney unit of study in year 3 and up to one (6 cp) University of Sydney unit of study in year 4 which is not listed in Tables D or E. The application must (1) be made prior to enrolment in the unit (2) be submitted with a written academic justification for enrolment by the student and (3) be submitted with written approval of the relevant unit of study coordinator.			
Table E - Year 4 Specialisations			
Agricultural Chemistry			
AFNR5107 **Principles of Biochemical Analysis**	6	**N** AGCH4007	Semester 1
ENSC2001 **Environmental Monitoring**	6	**A** Understanding of scientific principles and concepts including biodiversity, human impacts on the environment, properties of substances (e.g., acidity, alkalinity, solvents) and basic knowledge of statistics. **N** AGCH3033	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Agricultural Economics			
AREC3001 **Production Modelling and Management**	6	**P** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901	Semester 2
AREC3002 **Agricultural Markets**	6	**P** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901	Semester 2
Agricultural Genetics			
GENE4012 **Plant Breeding**	6	**P** (GENE2001 or GENE2002) and GENE4013	Semester 2
GENE4015 **Cytogenetics**	6	**P** (BIOM2001 or ENVX2001) and (GENE2001 or GENE2002)	Intensive July
Agronomy			
AGRO4003 **Crop and Pasture Agronomy**	6		Semester 1
AGRO4004 **Sustainable Farming Systems**	6		Semester 1
Animal Production			
AGRO4005 **Livestock Production Systems**	6	**A** Junior plant and animal biology (or equivalent), junior chemistry biology, intermediate crop and animal production, nutrition and physiology (or equivalent). **P** 6cp from BIOL1XXX	Semester 2
AGRO4006 **New and Emerging Tech in Animal Science**	6	**P** 6cp from BIOL1XXX	Semester 1
Entomology			
ENTO4004 **Insect Taxonomy and Systematics**	6	**P** ENTO2001 or BIOL2021 or BIOL2921	Semester 1
ENTO4003 **Integrated Pest Management**	6	**P** ENTO2001 or BIOL2021 or BIOL2921	Semester 2
Environmetrics			
Select two of the following units:			
BIOM4003 **Matrix Algebra and Linear Models**	6	**P** ENVX3002	Semester 1
BIOM4004 **Advanced Statistical Methods** *This unit of study is not available in 2018*	6	**P** BIOM4003 *Note: Department permission required for enrolment*	Semester 2
BIOM4005 **Biometrical Methods** *This unit of study is not available in 2018*	6	**P** ENVX3002 *Note: Department permission required for enrolment*	Semester 1
ENVX4001 **GIS, Remote Sensing and Land Management**	6	**P** ENVX3001 or GEOS2111 or GEOS2911	Semester 2
Food Science			
AGEN3004 **Food Processing and Value Adding**	6	**P** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX)	Semester 1
HORT4005 **Research and Practice in Horticulture**	6	**P** HORT3005	Semester 2
Forest Science			
ENSY3002 **Fire in Australian Ecosystems**	6	**P** AGEN2005 or BIOL2023 or BIOL2923	Semester 1
ENSY3003 **Forest Ecosystem Science**	6	**P** AGEN2001 or BIOL2023 or BIOL2923 or GEOS2121 *Students require a basic understanding of plant biology. Understanding principles of plant taxonomy and ecology will also be an advantage.*	Semester 2
Horticulture			
HORT3005 **Production Horticulture**	6	**P** (AGEN2001 and AGEN2005) or BIOL2X30 or BIOL2X31 or BIOL2X23 or AGEN2002 or AGRI2001	Semester 1
HORT4005 **Research and Practice in Horticulture**	6	**P** HORT3005	Semester 2
Hydrology			
LWSC3007 **Advanced Hydrology and Modelling**	6	**P** LWSC2002	Semester 1
ENVX3001 **Environmental GIS**	6	**P** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Soil Science			
SOIL3009 **Contemporary Field and Lab Soil Science**	6	**P** SOIL2003	Semester 1
SOIL3010 **The Soil at Work**	6	**P** SOIL2003 or SOIL2004	Semester 2
Table F - Other Year 4 electives			
AVBS4009 **Aquaculture**	6	**P** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3	Semester 1
AVBS4012 **Extensive Animal Industries**	6	**P** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3	Semester 1
VIRO3001 **Virology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3901 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
AGEN3008 **Indigenous Land and Food Knowledge**	6	*Note: Department permission required for enrolment* *Students must attend pre-trip briefing session (one day in S1 exam period), field trip (approximately two weeks in mid-year break) and post-trip workshop (one day in S2).*	Semester 2
AGEN5001 **Agricultural and Environmental Extension**	6		Semester 1
ANSC3107 **Animal Genetics 3**	6	**P** GENE2001 or GENE2002 or GEGE2X01 or MBLG2X72	Semester 2
AVBS4002 **Dairy Production and Technology**	6	**A** Enrolled students are expected to have some understanding of key components of the dairy production system, including basic knowledge of animal physiology and nutrition.	Semester 2
AVBS4008 **Intensive Animal Industries**	6	**P** (Animal and Veterinary Bioscience years 1-3) OR (Bachelor of Science in Agriculture years 1-3)	Semester 2

Bachelor of Science in Agriculture

Unit of study descriptions

Year 1

Year 1 will have the following 48 credit point structure:

GEOS1001
Earth, Environment and Society

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the gateway unit of study for Human Geography, Physical Geography, Environmental Studies and Geology. Its objective is to introduce the big questions relating to the origins and current state of the planet: climate change, environment, landscape formation, and the growth of the human population. During the semester you will be introduced to knowledge, theories and debates about how the world's physical and human systems operate. The first module investigates the evolution of the planet through geological time, with a focus on major Earth systems such as plate tectonics and mantle convection and their interaction with the atmosphere, hydrosphere, biosphere and human civilisations. The second module presents Earth as an evolving and dynamic planet, investigating global environmental change, addressing climate variability and human impacts on the natural environment and the rate at which these changes occur and how they have the potential to dramatically affect the way we live. Finally, the third module, focuses on human-induced challenges to Earth's future. This part of the unit critically analyses the relationships between people and their environments, with central consideration to debates on population change, resource use and the policy contexts of climate change mitigation and adaptation.

or

GEOS1901
Earth, Environment and Society Advanced

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1001, but will be required to carry out more challenging practical assignments.

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

or

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

or

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks

Please see unit outline on LMS

Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or

CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry. The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

ENVX1002
Introduction to Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Thomas Bishop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour tutorial per week, one 2-hour computer practical per week **Prohibitions:** ENVX1001 **Assessment:** One exam during the exam period (50%), three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This is an introductory statistics unit for students in the agricultural, life and environmental sciences. It provides the foundation for statistics and data science skills that are needed for a career in science and for further study in applied statistics and data science. In the first portion of the unit the emphasis is on describing data using statistical and graphical summaries, and probability models. In the second part the focus is on formal hypothesis testing on experimental data using statistical tests. The final part of the unit is on finding patterns in biological and environmental data, through the use of linear and non-linear functions. In the practicals the emphasis is on applying theory to analysing real datasets using the spreadsheet package Excel and the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

ENVI1003
Global Challenges: Food, Water, Climate

Credit points: 6 **Teacher/Coordinator:** A/Prof Stephen Cattle **Session:** Semester 2 **Classes:** Two lectures per week, 2hour tutorial/computer lab per week, two-day weekend field trip **Assessment:** One 2-hour exam (50%), field trip report (15%), tutorial presentation (20%), GIS reports (15%) **Practical field work:** Computer practicals and two day field trip **Mode of delivery:** Normal (lecture/lab/tutorial) day

In the 21st century the population of the world will increase both in size and its expectation in terms of food, energy and consumer demands. Against this demand we have a planet in crisis where natural resources are degraded, biodiversity is diminishing and planetary cycles related to climate are reaching points of irreversible change. Management of our precious natural resources is a balancing act between production and conservation as always, but now we have to do this against a background of potential large scale changes in climate. In this unit students will gain an understanding of the key environmental challenges of the 21st century; namely food security, climate change, water security, biodiversity protection, ecosystems services and soil security. In the second half using Australian case studies we will explore how we manage different agro-ecosystems within their physical constraints around water, climate and soil, while considering linkages with the global environmental challenges. Management now, in the past and the future will be considered, with an emphasis on food production. This unit is recommended unit for students interested in gaining a broad overview of the environmental challenges of the 21st century, both globally and within Australia.

AGEC1006
Economic Environment of Agriculture

Credit points: 6 **Session:** Semester 2 **Classes:** 2x1hr lectures/week, 1x1hr tutorial/week **Prohibitions:** AGEC1003 or AGEC1004 **Assumed knowledge:** HSC Mathematics **Assessment:** 1x2hr exam (55%) and 1x50 min mid-semester exam (25%) and workshop papers (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to give an understanding of some basic economic principles and to introduce the characteristics of the economic environment in which Australian agriculture operates. Topics to be covered include the structure, nature and history of the agricultural industries in Australia; agricultural adjustment in the world economy; introductory principles of production economics and farm management; elementary price theory and the factors affecting the demand, supply and prices of agricultural commodities.

Textbooks

HE Drummond and JW Goodwin, Agricultural Economics, 3rd edn (Prentice-Hall, 2011)

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

or

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

or

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

CHEM1012
Fundamentals of Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1XX1 **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Fundamentals of Chemistry 1B is built on a satisfactory prior knowledge of Fundamentals of Chemistry 1A. Compared to the mainstream Chemistry 1B, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1112
Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2 **Classes:** 1x3-hr lecture; 1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviours, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do we develop lotions that don't burn us, how do we measure UV absorption by sunscreens, how can we measure and alter soil pH, how are sticky things made, and how do we determine the concentration of vitamin C in juice? Through enquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B is built on a satisfactory prior knowledge of Chemistry 1A.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1912
Chemistry 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B (Advanced) is built on a satisfactory prior knowledge of Chemistry 1A (Advanced). Compared to the mainstream Chemistry 1B, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

or

CHEM1992
Chemistry 1B (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 12 weeks **Prerequisites:** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 **Assessment:** quizzes, assignment, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how food and medicines work, the properties of materials and substances. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as a demonstrated aptitude. Chemistry 1B (Special Studies Program) is restricted to students who have gained a Distinction in Chemistry 1A (Special Studies Program) or by invitation. The practical work syllabus for Chemistry 1B (Special Studies Program) is very different from that for Chemistry 1B and Chemistry 1B (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1B (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Year 2

Year 2 will have the following 48 credit point structure:

ENVX2001
Applied Statistical Methods

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 3-hour computer practical per week **Prerequisites:** [6cp from (ENVX1001 or ENVX1002 or BIOM1003 or MATH1011 or MATH1015 or DATA1001)] OR [3cp from (MATH1XX1 or MATH1906 or MATH1XX3 or MATH1907) and an additional 3cp from (MATH1XX5)] **Assessment:** One exam during the exam period (50%),three reports (10% each), ten online quizzes (2% each) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Available as a degree core unit only in the Agriculture, Animal and Veterinary Bioscience, and Food and Agribusiness streams

This unit builds on introductory 1st year statistics units and is targeted towards students in the agricultural, life and environmental sciences. It consists of two parts and presents, in an applied manner, the statistical methods that students need to know for further study and their future careers. In the first part the focus is on designed studies including both surveys and formal experimental designs. Students will learn how to analyse and interpret datasets collected from designs from more than than 2 treatment levels, multiple factors and different blocking designs. In the second part the focus is on finding patterns in data. In this part the students will learn to model relationships between response and predictor variables using regression, and find patterns in datasets with many variables using principal components analysis and clustering. This part provides the foundation for the analysis of big data. In the practicals the emphasis is on applying theory to analysing real datasets using the statistical software package R. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

Textbooks

No textbooks are recommended but useful reference books are:
- Mead R, Curnow RN, Hasted AM (2002) 'Statistical methods in agriculture and experimental biology.' (Chapman and Hall: Boca Raton).
- Quinn GP, Keough MJ (2002) 'Experimental design and data analysis for biologists.' (Cambridge University Press: Cambridge, UK).

MICR2031
Microbiology

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2931 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45-minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: one written assignment (15%), one group oral presentation (10%) and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the earth's trees. This unit of study will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require if you specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology or science education.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

or

MICR2931

Microbiology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prerequisites:** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2031 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45 minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: two written assignments (10%, 15%), and online quizzes (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the Earth's trees. In this unit of study you will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Detailed aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require to specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology, or science education. As an Advanced unit, MICR2931 provides increased challenge and academic rigour to develop a greater understanding and depth of disciplinary expertise. You will actively participate in a series of small group tutorials investigating the molecular detail of microbial communication and function, which will culminate in you creating a scientific research report that communicates your understanding of recent research in microbiology.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

AGEN2001

Plant Function

Credit points: 6 **Teacher/Coordinator:** A/Prof Tina Bell (Coordinator), Dr Thomas Roberts **Session:** Semester 1 **Classes:** Two 1-hour lectures, One 3-hour practical per week **Prerequisites:** 6cp from (BIOL1XXX or AGEN1004) and 12cp from (CHEM1XX1 or CHEM1XX2 or AGEN1006) **Prohibitions:** PHSI2005 or PHSI2006 or PHSI2905 or PHSI2906 **Assessment:** One 1-hour mid-semester exam (25%), one 1-hour final exam (25%), 1 x 1000wd essay (10%), four practical reports (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to develop an understanding of the structural and molecular principles that underlie the function of plants and how these principles relate to the use of plants by humans as sources of food, fibre and fuel.

The unit is a core unit for BScAgr students and an elective for BSc and other degree programs. It recognizes the specialized nature of plant anatomy and biochemistry and is a platform for students who wish to gain a sound knowledge of plant growth and development.

This unit covers the structure of plant cells and the anatomy of the major tissues and organs of plants. It also covers the biochemistry of the main carbohydrate, lipid, protein and nucleic acid constituents of plants, as well as the metabolic pathways that regulate plant growth and development.

At the completion of this unit students will be able to demonstrate theoretical knowledge of the structure and function of plants. Students will also be able to demonstrate abilities in the practice of laboratory methods used to analyse plants and the effective communication of experimental findings.

Students enrolled in this unit will gain research and enquiry skills through attendance at lectures and participation in laboratory classes and tutorials; information literacy and communication skills through the synthesis of information used to prepare practical reports; social and professional understanding by participation in group-work and assessments that seek to demonstrate the role of agriculture in the broader community.

Textbooks

Taiz L, Zeiger E (2010) Plant Physiology 5th ed.

SOIL2005

Soil and Water: Earth's Life Support Systems

Credit points: 6 **Teacher/Coordinator:** Prof Balwant Singh **Session:** Semester 1 **Classes:** Lectures: 3 hours per week; lab: 3 hours per week for 10 weeks **Prohibitions:** SOIL2003 or LWSC2002 **Assessment:** Field excursion: attendance and creative assessment (5%), the attendance at the excursion is complusory to get any mark for this assessment task; quiz: (10%); written assignment: modelling assessment including modelling (15%); laboratory report: group oral presentation and written assignment (20%); final exam: final written exam (50%) **Practical field work:** Approximately eight hours working field at Cobbitty Farm Wk 0 (Friday, 2 March 2018) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Soil and water are the two most essential natural resources on the Earth's surface which influence all forms of terrestrial life. This unit of study is designed to introduce students to the fundamental properties and processes of soil and water that affect food security and sustain ecosystems. These properties and processes are part of the grounding principles that underpin crop and animal production, nutrient and water cycling, and environmental sustainability. You will participate in a field excursion to examine soils in a landscape to develop knowledge and understanding of soil properties, water storage, water movement and cycling of organic carbon and nutrients in relation to food production and ecosystem functioning. At the end of this unit you will be able to articulate and quantify the factors and processes that determine the composition and behaviour of soil, composition of water, soil water storage and the movement of water on the land surface. You will also be able to describe the most important properties of soil and water for food production and sustaining ecosystem functions and link this to human and climatic factors. The field excursion, report and laboratory/computer exercises have been designed to develop communication, team work and collaborative efforts.

Textbooks

Brady, N.C. and Ray R. Weil. (2007). The Nature and Properties of Soils. 14th Edition, Prentice Hall, New Jersey. White, R.E. (2006) Principles and Practice of Soil Science: the Soil as a Natural Resource. 4th ed., Blackwell Science, Oxford. Diana H. Wall, Richard D. Bardgett, Valerie Behan-Pelletier, Jeffrey E. Herrick, T. Hefin Jones, Karl Ritz, Johan Six, Donald R. Strong, and Wim H. van der Putten (Eds.) (2012). Soil Ecology and Ecosystem Services. Oxford University Press, ISBN: 9780199575923. Kutllek, M and Nielsen, D.R. (2015). Soil: The Skin of the Planet Earth, Springer, ISBN: 978-94-017-9788-7 (Print) 978-94-017-9789-4 (Online). Gordon, N. D., McMahon, T. A., Finlayson, B. L., Gippel, C. J., and Nathan, R. J. (2004) Stream Hydrology: an Introduction for Ecologists, John Wiley and Sons Inc.

AGEN2006

Animal Production and Management

Credit points: 6 **Teacher/Coordinator:** A/Prof Luciano Gonzalez **Session:** Semester 2 **Classes:** Two 1-hour lectures per week **Prerequisites:** 12cp from (BIOL1XXX, AGEN1004) and 12cp from (CHEM1XX1, CHEM1XX2, AGEN1006) **Prohibitions:** AVBS1002 **Assumed knowledge:** HSC level Mathematics and Biology **Assessment:** One 2-hour final exam (50%), four online quizzes (20%), reflective statement (5%), handling and husbandry resource guide (20%), lectures and practicals attendance (5%) **Practical field work:** Six excursions/ practical sessions per semester **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to develop the student's ability to critically examine and evaluate the production and management of animals used for food and fibre in Australia and internationally. The unit will focus on new and emerging issues in animal production, including productivity, welfare, remote monitoring and management, animals in the environment, and meeting specifications in an ever-evolving marketplace. The identification, selection and breeding of animals that are optimally suited to production systems is a focus. New thinking and innovations that are being used to address scientific, industry and social expectation challenges will be a feature of the unit and case studies will be used throughout to examine interactions between these factors and their impact on management practices. Students will gain research and inquiry skills through research based group projects, information literacy and communication skills through online discussion postings, laboratory reports and presentations, and personal and intellectual autonomy through working in groups. At the successful completion of the unit, students will have the core knowledge and skills to enable them to lead developments in production animal industries in Australia and overseas.

Textbooks

No prescribed textbooks

BIOL2031
Plants and Environment

Credit points: 6 **Teacher/Coordinator:** Prof Brent Kaiser **Session:** Semester 2 **Classes:** Two lectures; one 4-hour practical session on a weekly basis **Prohibitions:** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2931 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quiz (20%), lab assignment (15%), presentation (15%), exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Plants grow across a range of environments, influencing form, function and ultimately reproductive success. Being sessile, plants lack the luxury of seeking an alternative 'stress-free lifestyle' and therefore rely on genetic and physical adaptations to survive and reproduce. To understand how a plant can achieve such flexibility requires knowledge of plant structure and the influence of environmental drivers on plant growth and function. In this unit, you will examine the physiological processes controlling plant growth and reproduction linked to environmental constraints. You will understand the relationship between tissue and cellular structure and their underlying role in physiological and metabolic activities, particularly processes involving light capture, photosynthesis, water regulation, nutrient management and metabolite redistribution. Lectures and interactive practicals will together introduce you to plant processes that underpin life on earth. Experimentation and analysis of plant physiological processes will develop a skill base that will lead to a greater understanding and appreciation of common plant processes. As a component of the Plant Science minor and the Plant Production major, BIOL2031 will provide an important platform to extend your interests in plant science and plant related fields across the curriculum.

Textbooks

Taiz, L. and Zeiger, E. (2010) Plant Physiology, Fifth Edition. Sinauer Associates. Sunderland, MA.

or

BIOL2931
Plants and Environment (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Brent Kaiser **Session:** Semester 2 **Classes:** Two 1-hour lectures/week; one 4-hour practical/week **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** AGEN2005 or BIOL3043 or BIOL3943 or BIOL2031 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** On-line quiz (20%), lab assignment (15%), independent project (15%), exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Plants grow across a range of environments, which influence form, function and ultimately reproductive success. Being sessile, plants lack the luxury of seeking an alternative 'stress-free lifestyle' and therefore rely on genetic and physical adaptations to help survive and reproduce. To understand how a plant can achieve such flexibility requires an understanding of plant structure and the influence that environmental drivers have on plant growth and function. In this unit, you will examine the physiological processes controlling plant growth and reproduction linked to environmental constraints. You will understand the relationship between tissue and cellular structure and their underlying role in physiological and metabolic activities, particularly processes involving light capture, photosynthesis, water regulation, nutrient management and metabolite redistribution. Lectures and interactive practicals will together introduce you to plant processes that we commonly depend upon for food production, and plant related materials. Experimentation and analysis of plant physiological processes will develop a skill base that will lead to a greater understanding and appreciation of common plant processes that guide plant growth. As a component of the Plant Science minor, this unit will provide an important platform to extend your interests in plant science and plant-related fields, including ecology, cell biology, genetics, breeding, agriculture, molecular biology, environmental law, education and the arts. The advanced unit has the same overall concepts as BIOL2031 but material is discussed in a manner that offers a greater level of challenge and academic rigour. Students enrolled in BIOL2931 participate in alternative components, which include a separate lecture and practical stream. The content and nature of these components may vary from year to year.

Textbooks

Resources required by the unit will be provided on the Blackboard learning management page for the unit. Taiz, L. and Zeiger, E. (2010) Plant Physiology, Fifth Edition. Sinauer Associates. Sunderland, MA.

BIOL2033
Entomology

Credit points: 6 **Teacher/Coordinator:** Dr Tanya Latty **Session:** Semester 2 **Classes:** Two 1-hour lectures; one 3-hour practical sessions a weekly basis **Prohibitions:** ENTO2001 **Assessment:** Practical test, skills-based assessment, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

Insects are the most abundant and diverse group of animals on earth; beetles alone account for 25% of animal life. Insects impact almost every facet of the ecosystem and our lives. Many insects play valuable and essential roles in pollinating different plant species, in predating and controlling insect pests and in recycling nutrients. Other insects are harmful and are the vectors for major diseases such as plague, malaria and recently emerged viral disease Zika. This unit will provide students with a broad introduction to entomology including insect evolution, ecology, anatomy and physiology. Students will learn applied entomological topics such as sustainable insect management in agricultural ecosystems, medical and veterinary entomology, insect-inspired technologies, and insects as a future food source for both livestock and humans. This theoretical background will be complemented by training in how to use and evaluate a range of identification tools such as lucid and traditional dichotomous keys that enable you to identify and classify major groups of insects. Practical classes will allow you to develop your identification, classification and preservation skills though examination of boxes of 'mystery insects' and through creating a museum-quality insect collection. Students will also learn procedures for caring and rearing live insects. By the end of the unit you will be well prepared to work in fields that require entomological skills.

Textbooks

Info will be made available via Blackboard. Keys will be available in practical classes and in the lab Manual

GEGE2001
Genetics and Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prohibitions:** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical

Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution.

or

GEGE2901

Genetics and Genomics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution. The Advanced mode of Genetics and Genomics will provide you with challenge and a higher level of academic rigour. You will have the opportunity to plan and carry out a project that will develop your skills in contemporary genetics/molecular biology techniques and will provide you with a greater depth of disciplinary understanding. The Advanced mode will culminate in a written report and in an oral presentation where you will discuss a recent breakthrough that has been enabled by the use of modern genetics and genomics technologies. This is a unit for anyone wanting to better understand the how genetics has shaped the earth and how it will shape the future.

Textbooks

TBA

GEGE2X01 is intended to be taken in semester 2

Year 3*

Year 3 will have the following structure: a core (24 credit points) of

AGCH3025

Chemistry and Biochemistry of Foods

Credit points: 6 **Teacher/Coordinator:** Dr Thomas Roberts (Coordinator), Prof Les Copeland **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 4-hour practical fortnightly **Prohibitions:** AFNR5102 or AGCH3017 or AGCH3024 **Assumed knowledge:** 6cp from (BCHM2XXX or BCMB2XXX or CHEM2XXX or AVBS2005) **Assessment:** One 2-hour exam (40%) and six lab reports (6x10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to give students an understanding of the properties of food constituents, and the interactions between these constituents during food processing, storage and digestion. The unit will develop an understanding of the relationship between form and functionality of constituents and the concept of fitness-for-purpose (i.e., quality) in converting agricultural products into foods. Students will gain an appreciation of the relationship between chemical composition and properties of macroconstituents (carbohydrates, proteins, lipids) and microconstituents (vitamins, minerals, antioxidants, flavour and anti-nutritional chemicals) and their functions in plant- and animal-based foods. The material presented in lectures and practical classes will enable students to develop research and inquiry skills and an analytical approach in understanding the biochemistry of foods, food processing and storage. On completing this unit, students will be able to describe the chemical and biochemical properties of major food constituents, and demonstrate an understanding of the functionality of these constituents in food processing and nutrition. Students will have gained experience in laboratory techniques used in industry for the analysis of some food products, and information literacy and communication skills from the preparation of practical reports.

Textbooks

Lecture and laboratory notes will be made available through Blackboard. There is no recommended textbook.

PPAT3003

Plant Health and Disease

Credit points: 6 **Teacher/Coordinator:** Prof David Guest (coordinator), A/Prof Michael Kertesz, Dr Rosalind Deaker, Prof Robert Park **Session:** Semester 1 **Classes:** 26 one-hour lectures and 12 three-hour practical classes **Prerequisites:** 6 credit points of Microbiology units **Assessment:** Take-home quizzes (20%), project report (10%), practical exam (20%), end of semester exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the impacts of microbes on plant productivity, food security and the management of natural environments. The lecture component discusses how microbes interact with plants at the ecosystem, whole plant, cellular and molecular levels, conditioning nutrient availability and acquisition, growth, yield, quality and environmental responses. The biology and epidemiology of plant-associated microbes, infection processes, colonisation strategies, plant responses and breeding for disease resistance will be discussed. The practical component introduces techniques used in handling, measuring and identifying plant-associated fungi and bacteria, diagnosis of plant disease and investigations of plant-microbe interactions, and develops skills in enquiry and problem solving through experimental design, execution and interpretation of data. Students learn to work in a research team, plan effective work schedules, work safely in a research laboratory with a range of scientific equipment, keep appropriate records, and use statistical analysis and simulations in research. The unit is core to the BScAgr degree and is available as an elective to BEnvSys and BSc students.

Textbooks

Schumann GL and Darcy CJ 2010. Essential Plant Pathology (2nd ed.). APS Press, St Paul, Minn., USA

AGRO3004

Managing Agro-Ecosystems

Credit points: 6 **Teacher/Coordinator:** A/Prof Brett Whelan (Coordinator), A/Prof Daniel Tan, Dr Lachlan Ingram, Prof. Michael D'Occhio. **Session:** Semester 2 **Classes:** One 2-hour lecture per week; one 1-hour tutorial/practical each week. Half-day field trips during weeks 3, 9, 10, 11 (no lecture or tutorial those weeks). **Prerequisites:** (BIOL2023 or BIOL2923 or PLNT2003 or AGEN2001) and (SOIL2003 or SOIL2005) **Assessment:** Three quizzes (30%), One viva voce (30%), one 2-hour exam (40%) **Practical field work:** Half-day field trips during weeks 3, 9, 10, 11 **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to provide a solid introductory understanding of the biology and management of cropping systems, with a focus on major Australian broad acre crops. The course examines a typical crop cycle, with an emphasis on cereals, especially wheat. An overview of the main crops grown in Australia is presented. The relationship between crop growth and soil and aerial environments is discussed, and the importance of water and water-use efficiency is highlighted. The physiology of crops--including germination, photosynthesis, vegetative and reproductive growth and development, transpiration, photosynthate partitioning, and mineral nutrient acquisition and use--is studied as the basis of crop yield and production. Biological processes associated with seed (grain) development are described. Weed management, pasture management, and precision agriculture are discussed in theoretical and practical terms, and an introduction to crop adaptation and breeding is presented. Successful students will attain the ability to appreciate and analyse some of the most important limitations to crop yield and production in Australia and how those limitations can be minimized or overcome through science-based planning and management practices.

Textbooks

Reference Books: Pratley, J. (ed) (2003) Principles of Field Crop Production. 4th Edition, Oxford Univ. Press, Melbourne
Connor DJ, Loomis RS, Cassman KG (2011) Crop Ecology: Productivity and Management in Agricultural Systems, 2nd Ed. Cambridge Univ Press, Cambridge
Marschner, P. (ed) (2012) Mineral Nutrition of Higher Plants. 3rd Edition, Academic Press, London.

SOIL2004
The Soil Resource

Credit points: 6 **Teacher/Coordinator:** A/Prof Stephen Cattle **Session:** Semester 2 **Classes:** (2x1 hr lec, 1x2 hr pracs)/wk, 25 hr (5 days) fieldtrip in the week immediately preceding the start of Semester 2 (Week O) **Assessment:** Fieldtrip participation (5%), soil survey mapping report (35%), laboratory report and poster presentation (20%), group tutorials (15%), viva voce exam (25%) **Practical field work:** Computer and laboratory practical sessions; 5-day fieldtrip **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will familiarise students with the description and mapping of soil types in the Australian landscape, with common analytical methods for soil and with the various forms of degradation that may alter the quality and function of soil. It is an applied soil science unit that builds on the fundamental soil science concepts learned in the SOIL2003 unit. The first practical component of the unit, a five-day soil survey, will give students experience in soil description and classification in the field, and soil samples collected during this survey will be subsequently analysed for a variety of attributes by the students in laboratory practicals. In the lecture series, topics including soil type distribution, soil quality, soil function, soil fertility and soil degradation will be discussed and linked to practical sessions. By the end of this unit, students will be able to construct maps of soil properties and soil type distribution, describe primary soil functions, soil attributes and types of soil degradation in an agricultural context, and be able to recognize and communicate the ability of a soil profile to sustain plant growth. Students will gain research and inquiry skills by collecting, analysing and interpreting soil survey data, and will gain communication skills by having to prepare and present a poster.

And 24 credit points from Table D.

Table D - Year 3 Electives

AFNR3001
Agro-ecosystems in Developing Countries

Credit points: 6 **Teacher/Coordinator:** A/Prof Damien Field **Session:** Semester 1 **Classes:** One 18 days fieldtrip before the start of semester 1, online tutorials **Assessment:** Participation (20%), research topic proposal (20%), oral presentation (20%), major report (40%) **Practical field work:** One 18 day field school **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit provides students with a direct contact with the agricultural reality of a developing country through a fieldtrip. Active learning in the field through contacts with farmers, public servants, cooperatives, private firms and NGOs should then motivate a critical reflection on the constraints to agricultural development in these environments.

The fieldtrip will be organized around central themes (for example, technology adoption, sustainable use of resources, access to credit, land use change) that will be introduced in a short series of seminars (held on main campus ahead of the departure and intended to provide a first introduction to some of the questions that are expected to be addressed in the field) and will constitute the focus of group work once back to main campus.

Although there are no formal prerequisites, the unit is directed to students that have completed most of the second year units in their degrees.

N.B. Department permission required for enrolment. Please note that, in practice, this unit will run prior to the start of semester 1 with all classes and the fieldtrip being scheduled during that period.

ANSC3102
Animal Reproduction

Credit points: 6 **Teacher/Coordinator:** A/Prof Simon de Graaf **Session:** Semester 1 **Classes:** Lectures 2 hours per week, tutorials 1 hour per week, practicals 3 hours per week **Assumed knowledge:** ANSC3104 **Assessment:** Written and oral assignments (30%), mid-semester practical exam (15%), end of semester written exam (55%) **Practical field work:** There will be several half day practical classes held at the Camden Campus **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a comprehensive programme on basic and applied aspects of male and female reproductive biology, with particular emphasis on livestock and domestic animals. The fundamental topics include reproductive cycles, sexual differentiation, gametogenesis, fertilization, embryo development, gestation and parturition. An understanding of the applications of advanced reproductive technologies is developed through lectures, tutorials and the assignments. In addition, practical instruction is given on semen collection and processing, manipulation of the reproductive cycle, artificial insemination, and pregnancy diagnosis in sheep and pigs. Classes are held at the Camperdown Campus in Sydney and at the Camden Campus Animal Reproduction Unit and Mayfarm piggery.

Textbooks

Senger, PL 2013, Pathways to pregnancy and parturition 3rd ed., Current Conceptions Inc

ANSC3103
Animal Structure and Function A

Credit points: 6 **Teacher/Coordinator:** Dr Peter White **Session:** Semester 1 **Classes:** Lectures 3 hours per week, laboratories/tutorials 2 hours per week (note these will vary depending upon the week) **Prerequisites:** 12cp from (BIOL1XXX, VETS1032, AGEN2001) **Assumed knowledge:** AVBS1002 **Assessment:** Assignments/online quiz and examinations **Practical field work:** This unit involves dissection of animal cadavers **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Structure and Function A will develop an understanding of the role of the body systems in maintaining homeostasis in an animal's internal environment. In ASFA the structure and function of the musculoskeletal, cardiovascular, respiratory, urinary and integumentary systems of the body are explored in depth particularly with reference to the maintenance of homeostasis. The developed understanding of the normal functioning of these systems allows identification of the impact on the animal of abnormal function of these systems. A study of the structure and function of muscle will include its role in movement and as meat in a production setting. The overall goals of the Unit are (i) to enable students to develop a rich understanding of the relationships between body systems and structures (to be continued in ASFB). (ii) to develop generic skills particularly in group work and oral presentation,(iii) to develop an appreciation of the links between structure and function and their relevance to animal disease and production that will be further developed in Veterinary Pathogenesis as well as in advanced, applied studies in Behaviour in third year and in 4th year Animal Production.

Textbooks

For the animal structure component of the unit: Dyce, KM, Sack, WO and Wensing, CJG 2002, Textbook of veterinary anatomy, 3rd edn, W.B.Saunders, Philadelphia
For the physiology component of this unit: Sherwood, L, Klandorf, H and Yancey, P H (2005) Animal Physiology: From Genes to Organisms, Thomson Brooks Cole, Belmont CA

AREC2001
Econ of Biological Production Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** ECON1001 or AGEC1006 or AGEC1102 **Assessment:** 2x1000wd Assignment (40%), 1x2hr Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is concerned with the application of microeconomic principles to management decisions in agricultural, forest, and fisheries systems. The unit builds on the theoretical knowledge acquired in previous studies and introduces the methods of applied economic analysis through a range of topics including: production functions (single and multi-output), cost and profit functions; methods for the measurement of productivity; optimisation in biological production systems; and production under risk.

AREC2003
Concepts in Enviro and Resource Economics

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** ECON1001 or ECON1040 or AREC1006 or AGEC1102 **Assessment:** 1x50min Mid-semster test (20%), 2x1000wd Assignments (30%), 1x2hr Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit builds on the concepts in microeconomics to provide insights into efficient and sustainable resource management. The primary focus of this unit is analytical. Emphasis is placed on the importance of property rights structures, cost-effective regulations and dynamic considerations in managing natural resource stocks and environmental assets. Some introductory material on economic valuation of environmental assets and benefit cost analysis is included.

BIOL3018
Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

Special Permission required for enrolmentor

BIOL3918
Gene Technology and Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **Prohibitions:** BIOL3018 **Assessment:** One 2-hour exam (60%), assignments (40%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of BIOL3018 Gene Technology and Genomics. The content and nature of these components may vary from year to year.

Special Permission required for enrolment

ECMT2150
Intermediate Econometrics

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** (ECMT1010 or BUSS1020 or MATH1905 or MATH1005 or MATH1015) and ECMT1020 **Prohibitions:** ECMT2110 **Assessment:** 4x250wd Individual Assignments (20%), 1x1hr Mid-semester Test (30%), 1x2hr Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide an introduction to the key issues involved in with the econometrics of cross-section and panel data. The topics this unit will cover include: instrumental variables; estimating systems by OLS and GLS; simultaneous equation models; discrete-choice models; treatment effects; and sample selection. Throughout the unit, emphasis will be placed on economic applications of the models. The unit will utilise practical computer applications, where appropriate.

ENVX3002
Statistics in the Natural Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** one 2-hour workshop per week, one 3-hour computer practical per week **Prerequisites:** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 **Assessment:** One exam during the exam period (50%), five assessment tasks (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Interdisciplinary Unit

This unit of study is designed to introduce students to the analysis of data they may face in their future careers, in particular data that are not well behaved. The data may be non-normal, there may be missing observations, they may be correlated in space and time or too numerous to analyse with standard models. The unit is presented in an applied context with an emphasis on correctly analysing authentic datasets, and interpreting the ouput. It begins with the analysis and design experiments based on the general linear model. In the second part, students will learn about the generalisation of the general linear model to accommodate non-normal data with a particular emphasis on the binomial and poisson distributions. In the third part linear mixed models will be introduced which provide the means to analyse datasets that do not meet the assumptions of independent and equal errors, for example data that is correlated in space and time. The units ends with an introduction to machine learning and predictive modelling. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

HORT3005
Production Horticulture

Credit points: 6 **Teacher/Coordinator:** Prof Daniel Tan **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 3-hour practical/workshop per week **Prerequisites:** (AGEN2001 and AGEN2005) or BIOL2X30 or BIOL2X31 or BIOL2X23 or AGEN2002 or AGRI2001 **Assessment:** One 3-hour exam (55%), three assignments (45%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers topics on the production of high quality food from perennial fruit crops, wine grapes, vegetables. It also covers the key aspects of the postharvest handling and quality assurance of fresh produce. At the end of this unit students are expected to have a detailed understanding of these areas of horticultural food production and be able to discuss related literature and the physiological principles underlying the commercial success of these horticultural enterprises. Students will also gain research and enquiry skills through research based practical sessions and assignments.

Textbooks

Recommended reading:
Louis Glowinski (2008) The complete book of fruit growing in Australia.
Lothian Books, Westwood, M.N. (1993) Temperate-zone pomology. Timber Press Inc.
Jackson, J.E (2003) Biology of apples and pears. Cambridge University Press.
Gopinadhan Paliyath et al. (Ed.) (2008) Postharvest biology and technology of fruits, vegetables, and flowers. Oxford: Wiley-Blackwell
Decoteau, D/. R (2000). Vegetable Crops. Upper Saddle River, NJ: Prentice Hall

ENSC2001
Environmental Monitoring

Credit points: 6 **Teacher/Coordinator:** Prof Feike Dijkstra **Session:** Semester 1 **Classes:** One 2-hour lecture per week; one 3-hour computer/laboratory practical per week; one 1-hour tutorial every other week **Prohibitions:** AGCH3033 **Assumed knowledge:** Understanding of scientific principles and concepts including biodiversity, human impacts on the environment, properties of substances (e.g., acidity, alkalinity, solvents) and basic knowledge of statistics. **Assessment:** Group presentation (10%), quiz (10%), lab reports (30%), final exam (50%) **Practical field work:** Two half-day field trips **Mode of delivery:** Normal (lecture/lab/tutorial) day

Human population growth is causing irreversible change to almost all environments on earth. The extent of human change has been so great that a new geological epoch, the anthropocene, has been defined. Global warming, the introduction of pollutants and excessive use of nutrients are stressors affecting the biodiversity and resilience of ecosystems, and pose threats to human and environmental health. These human impacts carefully need to be monitored to guide appropriate management of urban, natural and agricultural systems.

In this unit you will learn about transport pathways of pollutants, bioaccumulation, environmental toxicology (e.g., LD50 values), environmental monitoring and remediation techniques. Through lectures, laboratories and group work, concepts and methods of environmental monitoring will be illustrated and discussed including findings from the latest research. You will participate in structured practical exercises and field trips where you will apply sampling techniques, use bio-indicators and diversity indices to monitor ecosystem functioning. You will interpret the results and assess what the implications are for the ecological functioning and sustainable management of the environment. These hands-on exercises will be complemented with case-studies to guide you in critically analysing and evaluating environmental monitoring data. By taking this unit, you will acquire the necessary skills and knowledge in monitoring sites impacted by human activity.

Textbooks

Artiola, Pepper, and Brusseau. 2004. Environmental Monitoring and Characterization. Elsevier Academic Press.

ANSC3101
Animal Nutrition 3

Credit points: 6 **Teacher/Coordinator:** A/Prof Alex Chaves **Session:** Semester 2 **Classes:** Lectures 2-3 hours per week, lecture recording 1-2 hours per week and in situ and/or online laboratories 2-3 hours per week **Prerequisites:** AVBS2001 and [VETS1032 or AGEN2001 or (MICR2X31 or MICR2024)] **Corequisites:** AVBS2001 and MICR2X31 **Assumed knowledge:** Fundamentals of Biochemistry **Assessment:** Three individual problem based-learning (PBL) reports (total of 50%), one video presentation (15%), individual PBL creation (15%), and one online end of term exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The Unit is broadly divided into four sections, namely: estimating the nutritive characteristics of feeds; defining the nutrient requirements of animals; diet formulation; errors in feeding. The focus is on coming to an understanding of the assessment of nutritional adequacy and the avoidance and solving of nutritional problems, with a particular emphasis on animals used in agricultural production systems and wildlife. The principles discussed in this course will be expanded in the following year, in which species-specific systems will be described. The basis of successful feeding management is an understanding of the following: the composition of feeds; the digestibility and efficiency of utilisation of nutrients by the animal; the nutrient requirements of the animal; interactions between nutrients that influence health and production. And following from this, students will have the ability to formulate diets to meet animal requirements for a variety of purposes and under a variety of constraints; identify deficiencies, excesses and imbalances in diets and so avoid a decline in productive efficiency and/or a decline in health.

Textbooks

Students are encouraged to have an individual tablet PC or laptop with wireless connectivity (e.g.: ipad; Galaxy Note, etc.) during all classes. There is no required text for the course. There will be a number of recommended readings advocated to students in the Unit of Study outline.

ANSC3104
Animal Structure and Function B

Credit points: 6 **Teacher/Coordinator:** Dr Hamutal Mazrier **Session:** Semester 2 **Classes:** lectures 3 hours per week, laboratories/tutorials 2 hours per week, group work and/or independent learning activities 1 hour per week. Activities will vary on a weekly basis. **Prerequisites:** ANSC3103 **Assessment:** Anatomy dissection project (25%), critical review (25%), mid-semester and final examinations (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this Unit students will complete the study of the structure and function of organ systems in animals started in ANSC3103. The role of the immune system will be investigated in relation to maintenance of internal homeostasis. An introduction to the nervous system and male and female reproductive anatomy and physiology will form the basis for further applied studies in these areas in third year Units of Study in Animal Health and Disease and Animal Reproduction. There will be development of the generic skills of critically reading and writing.

Textbooks

For Animal Structure: Dyce, KM, Sack, WO and Wensing, CJG 2010, Textbook of Veterinary Anatomy, 4th edn, W.B.Saunders, Philadelphia

For Animal Function: for each topic, students will be directed to a recommended reading list available from the University of Sydney Library

The details of lecture outlines, objectives, reference lists, details of practical classes, staffing as well as other relevant class material will be available for students via the e-learning site.

AREC2002
Commodity Market and Price Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** ECON1001 or AGEC1006 or AGEC1102 **Assessment:** 1x50min Mid-semester Test (20%), 1xGroup Assignment (1000wd equiv) (20%), 1x2hr Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit focuses on the nature of agricultural and resource commodity markets, market demand relationships, market supply relationships, price determination under alternative market structures, marketing margin relationships, derived demand for inputs, spatially and temporally related markets, market dynamics, price expectations, commodity futures markets and other pertinent topics. Applied examples from the agricultural and resource industries and the overall economy will be used throughout the semester as illustrations of the principles involved.

AREC2004
Benefit-Cost Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** ECON1001 or AGEC1006 or AGEC1102 **Assessment:** 1x200wd benefit-cost presentation (5%), 1x1000wd group work essay (20%), 1x1000wd report (25%), 1x2hr final exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Foundational concepts in welfare economics, such as economic efficiency, criteria for assessing social welfare improvements, and economic surplus measures, are analysed in detail and applied to project evaluation and policy assessment. Procedures of conducting a benefit-cost analysis are presented, and tools of non-market valuation for public goods and environmental assets are covered in detail. These techniques include both stated and revealed preference techniques, including contingent valuation, choice modeling, hedonic pricing and travel cost methods.

AREC3001
Production Modelling and Management

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901 **Assessment:** 1x2hr Final Exam (60%), 1x50min Mid-semester Test (15%), 1x1500wd Assignment (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit builds on the principles of biological production economics and introduces optimisation methods to solve decision making problems encountered by agribusiness and natural resource firms and managers in public agencies. The principle focus is on the application of linear programming techniques, and students learn to consider solving decision making problems where the outcomes are not known with certainty, and where the timing of decisions is of essence.

ENVX3001
Environmental GIS

Credit points: 6 **Teacher/Coordinator:** A/Prof Inakwu Odeh **Session:** Semester 2 **Classes:** Three-day field trip, (two lectures and two practicals per week) **Prerequisites:** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX **Assessment:** One 15-minute presentation (10%), 3500wd prac report (35%), 1500wd report on trip excursion (15%), 2-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to impart knowledge and skills in spatial analysis and geographical information science (GISc) for decision-making in an environmental context. The lecture material will present several themes: principles of GISc, geospatial data sources and acquisition methods, processing of geospatial data and spatial statistics. Practical exercises will focus on learning geographical information systems (GIS) and how to apply them to land resource assessment, including digital terrain modelling, land-cover assessment, sub-catchment modelling, ecological applications, and soil quality assessment for decisions regarding sustainable land use and management. A three day field excursion during the mid-semester break will involve a day of GPS fieldwork at Arthursleigh University farm and two days in Canberra visiting various government agencies which research and maintain GIS coverages for Australia. By the end of this UoS, students should be able to: differentiate between spatial data and spatial information; source geospatial data from government and private agencies; apply conceptual models of spatial phenomena for practical decision-making in an environmental context; apply critical analysis of situations to apply the concepts of spatial analysis to solving environmental and land resource problems; communicate effectively results of GIS investigations through various means- oral, written and essay formats; and use a major GIS software package such as ArcGIS.

Textbooks

Burrough, P.A. and McDonnell, R.A. 1998. Principles of Geographic Information Systems. Oxford University Press: Oxford.

Clarke, K. C. 2003. Getting Started With Geographic Information Systems. 4th Edition. Prentice Hall: Upper Saddle River, New Jersey.

Year 4^

Year 4 students will complete:

AFNR4101
Research Project A

Credit points: 12 **Teacher/Coordinator:** Prof Budiman Minasny **Session:** Semester 1 **Classes:** No formal classes, approximately 18 hours per week **Prerequisites:** 144 credit points of level 1000-3000 units of study **Assessment:** Research proposal, literature review. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to develop a student's ability to undertake a major research project in an area of specialization. The unit builds on theoretical and applied knowledge gained across most of the units of study undertaken throughout their degree program. This unit is a corequisite with AFNR4102 and each student will work with an academic supervisor in an area of specialization and develop a well defined research project to be executed. The research project is undertaken to advance the students ability to build well-developed research skills, a strong analytical capacity, and the ability to provide high quality research results demonstrating a sound grasp of the research question. Working with an academic supervisor students will develop their ability to define a research project including the producing of testable hypotheses, identifying existing knowledge from reviewing the literature and the design and execution of a research strategy towards solving the research question. Students will build on their previous research and inquiry skills through sourcing a wide range of knowledge to solve the research problem and enhance their intellectual and personal autonomy by means of the development of experimental programs. Students will improve their written and planning skills by composing a research project proposal and the writing of a comprehensive literature review.

AFNR4001
Professional Development

Credit points: 6 **Teacher/Coordinator:** A/Prof Damien Field **Session:** Semester 2 **Classes:** Workshops over four years **Prohibitions:** AGRF4000 **Assessment:** One blog posting (10%), one on-line (multi-media) (30%) and one portfolio (60%) **Practical field work:** 40 days of professional experience, 1 week long excursion **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit of study is designed to allow students to critically reflect on the relationship between the rural enterprise and environment and how they can contribute to the future decisions and management affecting the rural community. It is a core unit of study in 4th year for the BAgrEc, BScAgr, BLWSc, BResEc, BHortSc which requires students to complete 40 days of professional experience with the expectation that students will examine the nature of facts from their degree in this environment. A minimum of 15 days must be completed on-farm/field. The remaining days may be at the student's discretion. The unit will be counted towards 4th year, but professional experience placements will normally be undertaken throughout the degree. In the early stages of the Professional Development program students participate in Faculty excursions that have been developed so they can experience a range of activities, such as research, extension, on-farm and industry both in the rural and urban environment to complement their learning within their individual degree programs. Building on this various workshops have been developed to assist students to identify a rural environment theme or issue of their interest with the specific emphasis being placed on them reflecting on how their new understandings of their theme of interest affects their personal and professional development. To complete this unit students will present a portfolio of their theme including critical reflection on the pivotal relationships between the academic degree, rural environment, professional experience, and beliefs and values if the rural community. Through developing these pivotal relationships, students will be able to use their new understandings to support and guide the future developments in the rural enterprise and environment. By developing and presenting the portfolio and engaging in other online activities the students will enhance their skills in inquiry, information literacy and communication. In particular the autonomous development of case studies reflecting the contemporary issues in agriculture and their professional placements the students will have to consider their understandings of ethical, social and professional issues and further develop the personal and intellectual autonomy.

Note: Department permission required for enrolment

AFNR4102
Research Project B

Credit points: 12 **Teacher/Coordinator:** Prof Budiman Minasny **Session:** Semester 2 **Classes:** No formal classes, approximately 18 hours per week **Prerequisites:** AFNR4101 **Assessment:** Oral presentation, research paper, poster. **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is a continuation of the major research project initiated in AFNR4101 and continues to build on theoretical and applied knowledge gained across most of the units of study undertaken throughout their degree program. Working with their academic supervisor in the area of specialization the student will continue to pursue the defined research project towards presenting final results and conclusions. The research results are presented in a format of a research paper as submitted to a research journal. The research paper and corrected literature review is combined and presented together as a thesis. Students will continue to build their research skills, develop strong analytical capacity, demonstrate a sound grasp of the topic, and an ability to interpret results in a broad framework. Working with an academic supervisor students will develop their ability to produce results of high quality, draw reliable conclusions and identify future areas avenues of research. Students will build on their previous research and inquiry skills through sourcing a wide range of knowledge to solve the research problem and enhance their intellectual and personal autonomy by means of the managing the research program. Students will improve their communication skills through oral presentation of their research findings, the production of a poster detailing their research findings and the writing of a research paper.

Year 4 students will complete one specialisation comprising two 6cp units of study (from Table E) and up to one elective unit from Table D, E or F.^ A student may apply to the degree coordinator for permission to enrol in up to one (6 cp) elective University of Sydney unit of study in year 3 and up to one (6 cp) University of Sydney unit of study in year 4 which is not listed in Tables D or E. The application must (1) be made prior to enrolment in the unit (2) be submitted with a written academic justification for enrolment by the student and (3) be submitted with written approval of the relevant unit of study coordinator.

Table E - Year 4 Specialisations

Agricultural Chemistry

AFNR5107
Principles of Biochemical Analysis

Credit points: 6 **Teacher/Coordinator:** Dr Claudia Keitel (Coordinator), Dr. Rosalind Deaker, Dr Thomas Roberts, A/Prof Michael Kertesz, Dr Feike Dijkstra, Dr Neil Wilson **Session:** Semester 1 **Classes:** 18 hours of lectures and 36 hours of laboratory during the semester **Prohibitions:** AGCH4007 **Assessment:** Assessment includes attendance and participation in lectures and practical classes. Each module will comprise 25% of the final assessment mark and satisfactory progress in all modules is required for the successful completion of this unit. (4x25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to expose students to the principles and practice of a diverse range of analytical methods used in life and environmental science. The unit of study will be presented in four modules including: materials and sampling techniques; separation techniques (chromatographic and electrophoretic); instrumentation and measurement techniques (spectral analyses); and microbiological and molecular biology techniques. Each module will be a combination of lectures and practical classes that will analyse common biological, agricultural or biochemical samples to illustrate the practical aspects of the theory. Students will also gain skills in data analysis relevant to the respective techniques.

At the completion of these modules, students will be familiar with the operation of a number of laboratory instruments, the theory that underpins their operation, be confident in the analysis of data, and be able to choose the most appropriate sampling strategy and analytical technique to perform high quality research.

ENSC2001
Environmental Monitoring

Credit points: 6 **Teacher/Coordinator:** Prof Feike Dijkstra **Session:** Semester 1 **Classes:** One 2-hour lecture per week; one 3-hour computer/laboratory practical per week; one 1-hour tutorial every other week **Prohibitions:** AGCH3033 **Assumed knowledge:** Understanding of scientific principles and concepts including biodiversity, human impacts on the environment, properties of substances (e.g., acidity, alkalinity, solvents) and basic knowledge of statistics. **Assessment:** Group presentation (10%), quiz (10%), lab reports (30%), final exam (50%) **Practical field work:** Two half-day field trips **Mode of delivery:** Normal (lecture/lab/tutorial) day

Human population growth is causing irreversible change to almost all environments on earth. The extent of human change has been so great that a new geological epoch, the anthropocene, has been defined. Global warming, the introduction of pollutants and excessive use of nutrients are stressors affecting the biodiversity and resilience of ecosystems, and pose threats to human and environmental health. These human impacts carefully need to be monitored to guide appropriate management of urban, natural and agricultural systems. In this unit you will learn about transport pathways of pollutants, bioaccumulation, environmental toxicology (e.g., LD50 values), environmental monitoring and remediation techniques. Through lectures, laboratories and group work, concepts and methods of environmental monitoring will be illustrated and discussed including findings from the latest research. You will participate in structured practical exercises and field trips where you will apply sampling techniques, use bio-indicators and diversity indices to monitor ecosystem functioning. You will interpret the results and assess what the implications are for the ecological functioning and sustainable management of the environment. These hands-on exercises will be complemented with case-studies to guide you in critically analysing and evaluating environmental monitoring data. By taking this unit, you will acquire the necessary skills and knowledge in monitoring sites impacted by human activity.

Textbooks

Artiola, Pepper, and Brusseau. 2004. Environmental Monitoring and Characterization. Elsevier Academic Press.

Agricultural Economics

AREC3001
Production Modelling and Management

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901 **Assessment:** 1x2hr Final Exam (60%), 1x50min Mid-semester Test (15%), 1x1500wd Assignment (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit builds on the principles of biological production economics and introduces optimisation methods to solve decision making problems encountered by agribusiness and natural resource firms and managers in public agencies. The principle focus is on the application of linear programming techniques, and students learn to consider solving decision making problems where the outcomes are not known with certainty, and where the timing of decisions is of essence.

AREC3002
Agricultural Markets

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** AREC2001 or AGEC2103 or ECOS2001 or ECOS2901 **Assessment:** 1000wd equivalent problem sets (30%), 1x1500wd essay (30%), 1x2hr final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to provide an understanding of the underlying forces driving agricultural markets. It addresses price analysis and efficiency, including aspects of form, time and space in agricultural marketing; information and contracts; changing consumer concerns (food safety, ethical production); futures market and other risk sharing devices. Building on the application of microeconomic theory to both production and consumption in agricultural markets, its content is analytical. The unit also investigates some of the forces which prevent the efficient operation of world agricultural markets, including impediments to trade, imperfect markets for inputs and outputs and market power along the agricultural supply chain.

Agricultural Genetics

GENE4012
Plant Breeding

Credit points: 6 **Teacher/Coordinator:** Prof Richard Trethowan **Session:** Semester 2 **Classes:** 20 lectures plus group presentations and 10 hours of practicals/demonstrations (26 July - 30 August) **Prerequisites:** (GENE2001 or GENE2002) and GENE4013 **Assessment:** One 2-hour exam (75%) and one group project (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Lectures and practical work are devoted to the theory, philosophy and practice of plant breeding. The unit addresses screening techniques, conservation of genetic variability, breeding for disease resistance and integration of molecular technology in applied plant breeding, with examples from both field and horticultural crops. The unit is taught in the context [of] climate change, food security and the evolving global intellectual property environment.

GENE4015
Cytogenetics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp (animal component coordinator), A/Prof Jaime Gongora **Session:** Intensive July **Classes:** Equivalent of two lectures/tutorials and three practicals per week **Prerequisites:** (BIOM2001 or ENVX2001) and (GENE2001 or GENE2002) **Assessment:** One 1500wd essay (25%), one 750wd practical report (10%) and one 1000wd fact sheet (15%), one 1200wd laboratory report (20%), one 2000wd assignment (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a final year elective in the two degrees, BScAgr, and BAnVetBiosci. Approximately a half of the face-to-face contact hours will be given as an intensive, and this section of the unit will be held during the mid-year break before semester 2. Lecture and practical work in cytogenetics, especially of plant and animal species of applied interest in plant agriculture, animal agriculture and other applied interest in animal genetics, such as companion, native and endangered species. The lecture component covers the molecular nature of chromosomes and their transmission, variation in chromosome behaviour, both normal and disease related. In addition, the uses of chromosome engineering to produce variation in plants and animals will also be covered. The practical component covers the technologies used to study chromosomes or both plants and animals, both mitotic and meiotic chromosomes, and molecular techniques such as in situ hybridisation, gene activity and chromosomal protein localisation. On completion, students will be able to apply cytogenetic knowledge and technologies to species of eukaryotes of economic significance, and know how cytogenetic processes have affected the development of these species.

Agronomy

AGRO4003
Crop and Pasture Agronomy

Credit points: 6 **Teacher/Coordinator:** A/Prof Daniel Tan(Coordinator), A/Prof Brett Whelan, Dr Rosalind Deaker **Session:** Semester 1 **Classes:** Twelve 2-hour lectures in weeks 1-13; four 2-hour practicals in weeks 8, 11-13; field excursions: week preceding start of semester and 6 (subject to weather) **Assessment:** Two data analysis projects (2x50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines agronomy as the discipline that underpins agricultural production. As a case study, the cotton industry is examined in detail to understand the end-user and social demands on agricultural production, the technical issues that challenge the farmer and the diversity of other specialist information from relevant disciplines such as entomology, pathology and soil science that must be integrated into the farming system. The unit also covers precision agriculture, legume science, rangeland science and crop protection. This unit includes a one-week excursion to cotton growing areas in northern NSW and Qld, specialist intensive instruction provided by the Cotton RDC, and a series of workshops, tutorials that provides analysis and synthesis of the major farming systems in this industry. Pasture production is also considered in the context of farming systems.

AGRO4004
Sustainable Farming Systems

Credit points: 6 **Teacher/Coordinator:** A/Prof Daniel Tan (Coordinator), Prof David Guest **Session:** Semester 1 **Classes:** Negotiated practicals and workshops (63 hours) **Assessment:** Final exam (50%), 3 assignments (3x10%), data analysis project (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to provide students with training in the professional skills required to practice agronomy. The unit principally builds on theoretical and applied knowledge gained in third year agronomy (AGRO3004). In this unit students will integrate their knowledge of plant physiology, soil science, experimental design, and biometry to address applied problems in agronomy, namely the issue of sustainability. Students will develop their ability to establish conclusions towards making recommendations for long term sustainability of crop and pasture systems. By implementing and managing a major field and/or glasshouse experiment(s) students will develop their research and inquiry skills. Team work is strongly encouraged in this unit and the integration and reporting of research findings will facilitate critical thinking and development of written communication skills. After completing this unit, students should be able to confidently design and manage a glasshouse/field experiment, and interpret and communicate their findings, by integrating knowledge from across disciplinary boundaries.

Animal Production

AGRO4005
Livestock Production Systems

Credit points: 6 **Teacher/Coordinator:** A/Prof Luciano Gonzalez **Session:** Semester 2 **Classes:** One 3-hour lecture followed by one 3-hour practical per week at Camden Campus **Prerequisites:** 6cp from BIOL1XXX **Assumed knowledge:** Junior plant and animal biology (or equivalent), junior chemistry biology, intermediate crop and animal production, nutrition and physiology (or equivalent). **Assessment:** Practical reports (40%), case study assignment (40%), case study presentations (20%). **Practical field work:** Farm consultancy case study, computer lab and field **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines livestock production following a whole system approach by integrating animals, vegetation, environment (soil, water, air and climate) and management, and analysing the interactions between them. The unit builds on principles delivered in core (AGEN1001, AGEN1004 and AGEN2006) and elective (ANSC3101, AVBS4012) units of study for those students interested in pursuing a career in Animal Science. The focus of this unit is on farm business planning and consulting for beef cattle and sheep. Particularities and commonalities of these livestock systems will be presented. The pasture/grassland section examines the relationship between livestock production, forage quality and quantity in both native and sown pastures, impact of weeds, and grazing management. Interactions between climate, forage and animal production are also addressed. The animal component of this unit integrates concepts in grazing ecology, nutrition, reproduction, animal behaviour and welfare, and economics to develop skills in managing the production process for improved productivity, production efficiency and environmental stewardship. A special characteristic of this unit is the strong focus on simulation models, decision support systems, and new technologies. Computer-based and field classes will provide direct experience in business management of livestock production systems and skills in record keeping and data handling. Students completing this unit will acquire skills to examine and manage livestock enterprises following a whole-system approach required in roles as consultants, advisors or managers of sustainable livestock enterprises.

AGRO4006
New and Emerging Tech in Animal Science

Credit points: 6 **Teacher/Coordinator:** A/Prof Luciano Gonzalez **Session:** Semester 1 **Classes:** One 3-hour lecture followed by one 3-hour practical per week at Camden Campus (practicals include demonstraton and hands-on with remote sensing, GIS and ICT technologies) **Prerequisites:** 6cp from BIOL1XXX **Assessment:** Final Assignment presentation (10%) and document (40%), video proposal for major assignment (10%) and practical reports (computer labs and field classes, 40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to provide students with an advanced understanding of new and emerging livestock technologies in Australia and overseas. Examples of these technologies include (1) next-generation infrared and laser scanning to determine physiological status and whole body composition, (2) diet formulation to enhance the nutritional and eating quality of livestock food products, (3) new vaccines and other therapeutics to regulate fertility, growth and behaviour whilst enhancing welfare and wellbeing, (4) microRNA technology to influence cellular, endocrine and physiological processes, (5) new genomics and laboratory-based reproductive technologies for advanced livestock breeding, (6) technologies to monitor and control animal behaviour, (7) unmanned ground and aerial vehicles to monitor livestock and the environment, (8) sensors and advanced image-capture technology to record the attributes of soil, air and the feedbase, (9) data-fusion science to integrate, analyse and interpret collected data, and (10) modelling of livestock systems. Students will gain research and inquiry skills through research based group projects, information literacy and communication skills through on-line discussion postings, laboratory reports and presentations, and personal and intellectual autonomy through working in groups. At successful completion of the unit students will have a sound knowledge of new and emerging technologies that will shape the livestock industries in Australia and overseas. This will provide valuable grounding for students preparing for postgraduate study and other learning and career paths.

Textbooks

No prescribed text but referral to references listed from library

Entomology

ENTO4004
Insect Taxonomy and Systematics

Credit points: 6 **Teacher/Coordinator:** Dr Tanya Latty **Session:** Semester 1 **Classes:** One 2-hour lecture, one 3-hour practical or field trip per week, commencing week 1 **Prerequisites:** ENTO2001 or BIOL2021 or BIOL2921 **Assessment:** Insect collection (60%), research plan (20%), class participation (5%), presentation (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Knowledge of the evolutionary relationships between insect groups contributes to our understanding of insect biology and correct taxonomic identification of insects is essential for all areas of entomological research, including pest management. This unit builds on the knowledge gained in second year entomology (BScAgr and BHortSc) and is a core unit for the entomology specialisation (BScAgr). Key concepts that underpin the study of insect systematics, biogeography and phylogeny are described using examples from the evolutionary development of insects. The role of morphological, genetic and molecular studies in the classification of insects is examined. Students will demonstrate their knowledge of insect taxonomy through individual projects. Students will have the opportunity to become `expertsÂ¿ on a self-selected insect order.Students will practice their communication skills and develop personal and intellectual autonomy through in-class discussions and presentations Students will see insect taxonomy in actino through field trips to museums, laboratories and hospitals.

Textbooks

Recommended: Llewellyn, R. (Ed.) 2002. The Good Bug Book. 2nd edition, Australasian Biological Control, Richmond, NSW. 110 pp.
Bailey, PT (Ed.) 2007. Pests of field crops and pastures. CSIRO Publishing, Collingwood, Vic. 520 pp.
Pedigo, LP and Rice, ME. 2009. Entomology and Pest Management, 6th edn. Pearson Prentice Hall, 784 pp.

ENTO4003
Integrated Pest Management

Credit points: 6 **Teacher/Coordinator:** Dr Tanya Latty **Session:** Semester 2 **Classes:** One 2-hour lecture, one 3-hour practical per week, commencing week 1 **Prerequisites:** ENTO2001 or BIOL2021 or BIOL2921 **Assessment:** One 2-hour exam (30%), one case study (30%), two consultancy reports (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The focus of this unit is the development and adoption of sustainable integrated pest management (IPM) within Australian (and global) agriculture. It builds on the knowledge gained in second year entomology (BScAgr) and is a core unit for the entomology specialtisation (BScAgr). Applied entomology deals with the sustainable control of insect pests using a variety of techniques such as biological control and habitat manipulation. Students will compare the advantages and disadvantages of different pest control strategies and evaluate the importance of insect ecology, control methods and socio-economic factors to successful adoption of integrated pest management. Field trips will demonstrate the practical application of IPM concepts presented in lectures. Research, inquiry and information literacy skills will be improved through critical review of current literature and compilation of a case study. Students will practice their communication skills and develop personal and intellectual autonomy through a group project and in-class discussion.

Textbooks

Recommended: Llewellyn, R. (Ed.) 2002. The Good Bug Book. 2nd edition, Australasian Biological Control, Richmond, NSW. 110 pp.
Bailey, PT (Ed.) 2007. Pests of field crops and pastures. CSIRO Publishing, Collingwood, Vic. 520 pp.
Pedigo, LP and Rice, ME. 2009. Entomology and Pest Management, 6th edn. Pearson Prentice Hall, 784 pp.

Environmetrics

Select two of the following units:

BIOM4003
Matrix Algebra and Linear Models

Credit points: 6 **Teacher/Coordinator:** A/Prof Peter Thomson **Session:** Semester 1 **Classes:** One 3-hour workshop per week, three 1-day workshops (exam period) **Prerequisites:** ENVX3002 **Assessment:** Two data analysis projects (50% each) **Mode of delivery:** Block mode

In order to obtain a deeper understanding of statistics it is necessary to learn more about matrices as used to develop and explain statistical and mathematical concepts. Matrices are not just used in statistics: they find use in mathematical models in biology (e.g. age structured population growth models), engineering (e.g. structural perturbation analysis), and economic models (e.g. decision analysis). There are three aims to this unit. Firstly, we will revise matrices learnt in earlier units and then introduce new concepts such as special matrices (symmetric, orthogonal, idempotent), rank, eigenvalues and eigenvectors, as well as some matrix and vector calculus. The second aim is to apply these techniques to the formulation of linear models and linear mixed models which have been introduced in earlier units. The underlying theory will be developed along with more advanced applications. The third aim is to provide an introduction to key application areas for the future; (i) the analysis of big datasets, ones with many predictor variables, and (ii) the analysis of spatial data. Furthermore, the students will be introduced to R, an open source statistical software package.

Textbooks

Textbooks: None. Many reference books such as:
Draper, N.R., and Smith, H. (1981). Applied Regression Analysis, Second edition. N.Y.: Wiley
Graybill, F.A. (1969). Introduction to Matrices with Applications in Statistics. Belmont: Wadsworth
Harville, D.A. (1997). Matrix Algebra from a Statistician's Perspective. New York: Springer
Healy, M.J.R. (1986). Matrices for Statistics. Oxford: Clarendon
Mead, R. (1988). The Design of Experiments. Cambridge: Cambridge U.P
Neter, J., Wasserman, W., and Kutner, M.H. (1985). Applied Linear Statistical Models. Homewood, Il.: Irwin
Searle, S.R. (1982). Matrix Algebra Useful for Statistics. N.Y.: Wiley

BIOM4004
Advanced Statistical Methods

Credit points: 6 **Teacher/Coordinator:** Dr Thomas Bishop **Session:** Semester 2 **Classes:** 3x1 hr lecture/wk, 1x1 hr tutorial/wk, 1x1 hr computer practical/wk **Prerequisites:** BIOM4003 **Assessment:** 1 Ã Final Exam (50%), 3 Assignments (10% each), Data Analysis Project (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit consists of 3 components; multivariate statistics, sample designs and generalized linear models. In the first part principal component analysis and multivariate analysis of variance (MANOVA) will be covered. In the second part basic sample designs such as simple random, stratified random, ratio estimation and cluster sampling will be covered. Finally generalized linear models will be introduced with more theoretical detail than is taught in earlier units. Research skills will developed by project work involving the analysis of a real world dataset from a relevant discipline.

BIOM4005
Biometrical Methods

Credit points: 6 **Teacher/Coordinator:** Dr Thomas Bishop **Session:** Semester 1 **Classes:** 3x1 hr lecture/wk, 1x1 hr tutorial/wk, 1x1 hr computer practical/wk **Prerequisites:** ENVX3002 **Assessment:** 1 Ã Final Exam (50%), 3 Assignments (10% each), Data Analysis Project (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit introduces students to essential statistical and mathematical theory that should be at the fingertips of practising statisticians. Topics include a comprehensive review of statistical distributions and their properties; including the binomial, Poisson, geometric, normal and exponential distributions. In addition techniques such as method of moments and maximum likelihood estimation will be introduced for fitting the distributions to the data will be explored. Research skills will developed by project work involving the analysis of a real world dataset.

Textbooks

Many reference books exist in various Libraries.

ENVX4001
GIS, Remote Sensing and Land Management

Credit points: 6 **Teacher/Coordinator:** A/Prof Inakwu Odeh **Session:** Semester 2 **Classes:** One 2-hour lecture per week in weeks 1-7, project work weeks 8-13, , one 3-hour practical per week in weeks 1-7. **Prerequisites:** ENVX3001 or GEOS2111 or GEOS2911 **Assessment:** One half hour presentation (5%) in weeks 12 and 13, practical work reports (50%) weekly in weeks 1-6, one 2500wd project report (45%) due by week 13 **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is aimed at advanced techniques in Remote Sensing (RS), linked with Geographical Information Systems (GIS), as applied to land management problems. We will review the basic principles of GIS and then focus on advanced RS principles and techniques used for land resource assessment and management. This will be followed by practical training in RS techniques, augmented by land management project development and implementation based on integration of GIS and RS tools. The unit thus consists of three separate but overlapping parts: 1) a short theoretical part which focuses on the concepts of RS; 2) a practical part which aims at developing hands-on skills in using RS tools, and 3) an application-focused module in which students will learn the skills of how to design a land management project and actualize it using integrated GIS and RS techniques.

Textbooks

Reference Textbook: Jesen J. R. 2006. Remote sensing of the environment: an earth resource perspective. 2nd ed. Pearson Prentice Hall Upper Saddle, New Jersey.

Rees W.G. 2001. Physical principles of remote sensing. 2nd ed. Cambridge University Press, Cambridge, United Kingdom.

Food Science

AGEN3004
Food Processing and Value Adding

Credit points: 6 **Teacher/Coordinator:** Dr Kim-Yen Phan-Thien **Session:** Semester 1 **Classes:** Two 1-hour lectures per week **Prerequisites:** 6cp from (CHEM1XXX or AGEN1004 or AGEN1006) and 6cp from (BIOL1XXX or MBLG1XXX) **Assessment:** Two individual assignments (10% + 20%), one group processing report (20%), one group oral presentations (10%), one 2-hour final exam (40%) **Practical field work:** One 3-hour practical or excursion per week **Mode of delivery:** Normal (lecture/lab/tutorial) day

From the grinding of grains to the drying of meats, humans have been processing their food since the dawn of civilisation. Over the decades, many traditional processing methods have become industrialised, while new processing technologies have emerged, quietly revolutionising our food systems, diets and cultures. In this unit of study, students examine the biochemical and physicochemical transformations that occur in food materials during processing and how processing parameters affect the fulfilment of food quality, shelf-life, and safety objectives. The unit is roughly organised into modules on (1) processing to modify food structure; (2) processing for preservation; and value-adding, focused on (3) healthier food and (4) fermentation as interesting case studies in food processing.The unit will include lectures, laboratory sessions, group work and visits to food processing facilities.

Textbooks

No prescribed textbooks

HORT4005
Research and Practice in Horticulture

Credit points: 6 **Teacher/Coordinator:** A/Prof Brian Jones (Coordinator), Dr Kim-Yen Phan-Thein **Session:** Semester 2 **Classes:** One 2-hour tutorial per week; one 1-week excursion **Prerequisites:** HORT3005 **Assessment:** Industry reports (2x20%), field trip industry report (10%), two practical reports (2x10%), end of semester exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study provides students with a scientific grounding in the sustainable production of safe and nutritious fruit, vegetables and mushrooms. The unit encompasses the fundamentals of production system options, resource management and marketing practices. Case studies will be used to exemplify important developments in horticultural production, supply and marketing chains. Students will examine multiple real world examples of horticulture to develop skills in systematic problem-solving in production and marketing. Combining relevant industry knowledge, critical analytical skills, and a systems perspective will enable students to make valid, scientifically-informed decisions in horticulture and beyond. The unit is comprised of: lectures/workshops, practicals in production and post-harvest horticulture, and site visits to producers, research sites and industry bodies. The program includes a week-long field trip to major horticultural production regions to view operations and Q and A with owner/operators.

Forest Science

ENSY3002
Fire in Australian Ecosystems

Credit points: 6 **Teacher/Coordinator:** A/Prof Tina Bell **Session:** Semester 1 **Classes:** Two 1-hour lectures, one 3-hour practical per week **Prerequisites:** AGEN2005 or BIOL2023 or BIOL2923 **Assessment:** One 2-hour exam (40%), one 2000-2500wd essay (20%), three practical reports (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is intended to describe fundamental scientific knowledge relating to fire behaviour and ecological and social effects of bushfire in Australian ecosystems. The student will gain a greater understanding of how fire has shaped the landscape and the people. It is an elective unit that builds on basic knowledge gained in junior-level biology and chemistry and intermediate-level plant biology and soil science subjects. Firstly, fire behaviour including the elements of weather, fuel and landscape will be explained and examined in relation to predictive modelling and climate change. Secondly, the fire response of flora, fauna, fungi and microorganisms will be described at a range of different scales and analysed against a background of current land management practices in Australia. Social aspects of bushfire will be discussed and analysed according to contemporary policies and practices. At the end of this unit, students will be able to apply fire behaviour and ecological principles for planning purposes and to integrate scientific information from a range of sources to assess fire impacts on the environment and human communities. The students will gain research, literacy and communication skills through field-based data collection, essay and report writing and oral presentations.

Textbooks

A reading list will be provided consisting of selected book chapters, journal articles and other publications

ENSY3003
Forest Ecosystem Science

Credit points: 6 **Teacher/Coordinator:** Dr Andrew Merchant **Session:** Semester 2 **Classes:** Two lectures per week, one tutorial per fortnight, one field excursion (two days) in week 6 of semester **Prerequisites:** AGEN2001 or BIOL2023 or BIOL2923 or GEOS2121 **Assessment:** One 2-hour exam (50%), one 2000wd essay (40%), one oral presentation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students require a basic understanding of plant biology. Understanding principles of plant taxonomy and ecology will also be an advantage.

This unit of study enables students to understand the management and conservation of trees and forests in a changing climate. It is an elective unit for students enrolled in advanced topics for the Bachelor of Environmental Systems course program. Beginning with an introduction to the unique chemical, physical and ecological characteristics of trees, this unit then focuses on policy development and management prescriptions driven by fundamental processes of ecosystem function. At the end of this unit students will be able to articulate critical evaluations of scientific and policy based documents in relation to research and management of trees in the Australian landscape. Students will be given the opportunity to gain firsthand knowledge of Australian forest management by participating in a two day field excursion (in week 6 of semester) combined with industry, government, research and conservation groups. At the end of this unit, students will be able to articulate strengths, weaknesses and improvements to the management of Australian forests for the purposes of production, conservation and climate change adaptation. Students will gain an intricate knowledge of tree function and be able to relate this understanding to the management of trees and forests in a changing environment. Students will develop skills to enable effective communication with industry, conservation and governmental groups.

Horticulture

HORT3005
Production Horticulture

Credit points: 6 **Teacher/Coordinator:** Prof Daniel Tan **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 3-hour practical/workshop per week **Prerequisites:** (AGEN2001 and AGEN2005) or BIOL2X30 or BIOL2X31 or BIOL2X23 or AGEN2002 or AGRI2001 **Assessment:** One 3-hour exam (55%), three assignments (45%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers topics on the production of high quality food from perennial fruit crops, wine grapes, vegetables. It also covers the key aspects of the postharvest handling and quality assurance of fresh produce. At the end of this unit students are expected to have a detailed understanding of these areas of horticultural food production and be able to discuss related literature and the physiological principles underlying the commercial success of these horticultural enterprises. Students will also gain research and enquiry skills through research based practical sessions and assignments.

Textbooks

Recommended reading:
Louis Glowinski (2008) The complete book of fruit growing in Australia.
Lothian Books, Westwood, M.N. (1993) Temperate-zone pomology. Timber Press Inc.
Jackson, J.E (2003) Biology of apples and pears. Cambridge University Press.
Gopinadhan Paliyath et al. (Ed.) (2008) Postharvest biology and technology of fruits, vegetables, and flowers. Oxford: Wiley-Blackwell
Decoteau, D/. R (2000). Vegetable Crops. Upper Saddle River, NJ: Prentice Hall

HORT4005
Research and Practice in Horticulture

Credit points: 6 **Teacher/Coordinator:** A/Prof Brian Jones (Coordinator), Dr Kim-Yen Phan-Thein **Session:** Semester 2 **Classes:** One 2-hour tutorial per week; one 1-week excursion **Prerequisites:** HORT3005 **Assessment:** Industry reports (2x20%), field trip industry report (10%), two practical reports (2x10%), end of semester exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study provides students with a scientific grounding in the sustainable production of safe and nutritious fruit, vegetables and mushrooms. The unit encompasses the fundamentals of production system options, resource management and marketing practices. Case studies will be used to exemplify important developments in horticultural production, supply and marketing chains. Students will examine multiple real world examples of horticulture to develop skills in systematic problem-solving in production and marketing. Combining relevant industry knowledge, critical analytical skills, and a systems perspective will enable students to make valid, scientifically-informed decisions in horticulture and beyond. The unit is comprised of: lectures/workshops, practicals in production and post-harvest horticulture, and site visits to producers, research sites and industry bodies. The program includes a week-long field trip to major horticultural production regions to view operations and Q and A with owner/operators.

Hydrology

LWSC3007
Advanced Hydrology and Modelling

Credit points: 6 **Teacher/Coordinator:** A/Prof Willem Vervoort (Coordinator), Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** 2-hour lecture per week, 3-hour practical per week **Prerequisites:** LWSC2002 **Assessment:** Four practical assessments and reports (50%), take-home exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to allow students to examine advanced hydrological modeling focusing on catchment level responses and uncertainty. Students will learn how to develop their own simulation model of catchment hydrological processes in R and using SWAT and review the possibilities and impossibilities of using simulation models for catchment management. Students will further investigate landuse change impacts and climate change impacts the variability in hydrological responses. At the end of this unit, students will be able to calibrate and evaluate a catchment model, articulate advantages and disadvantages of using simulation models for catchment management, justify the choice of a simulation model for a particular catchment management problem, identify issues in relation to uncertainty in water quality and quantity The students will gain research and inquiry skills through research based assignments, information literacy and communication skills through laboratory reports and a presentation and personal and intellectual autonomy through working in groups.

Textbooks

Textbooks (Recommended reading)
Beven, K.J. Rainfall-Runoff modeling, The Primer, John Wiley and Sons, Chichester, 2001

ENVX3001
Environmental GIS

Credit points: 6 **Teacher/Coordinator:** A/Prof Inakwu Odeh **Session:** Semester 2 **Classes:** Three-day field trip, (two lectures and two practicals per week) **Prerequisites:** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX **Assessment:** One 15-minute presentation (10%), 3500wd prac report (35%), 1500wd report on trip excursion (15%), 2-hour exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to impart knowledge and skills in spatial analysis and geographical information science (GISc) for decision-making in an environmental context. The lecture material will present several themes: principles of GISc, geospatial data sources and acquisition methods, processing of geospatial data and spatial statistics. Practical exercises will focus on learning geographical information systems (GIS) and how to apply them to land resource assessment, including digital terrain modelling, land-cover assessment, sub-catchment modelling, ecological applications, and soil quality assessment for decisions regarding sustainable land use and management. A three day field excursion during the mid-semester break will involve a day of GPS fieldwork at Arthursleigh University farm and two days in Canberra visiting various government agencies which research and maintain GIS coverages for Australia. By the end of this UoS, students should be able to: differentiate between spatial data and spatial information; source geospatial data from government and private agencies; apply conceptual models of spatial phenomena for practical decision-making in an environmental context; apply critical analysis of situations to apply the concepts of spatial analysis to solving environmental and land resource problems; communicate effectively results of GIS investigations through various means- oral, written and essay formats; and use a major GIS software package such as ArcGIS.

Textbooks

Burrough, P.A. and McDonnell, R.A. 1998. Principles of Geographic Information Systems. Oxford University Press: Oxford.
Clarke, K. C. 2003. Getting Started With Geographic Information Systems. 4th Edition. Prentice Hall: Upper Saddle River, New Jersey.

Soil Science

SOIL3009
Contemporary Field and Lab Soil Science

Credit points: 6 **Teacher/Coordinator:** Prof Budiman Minasny (Coordinator), Prof Balwant Singh, A/Prof. Stephen Cattle, Prof Alex McBratney, A/Prof Damien Field **Session:** Semester 1 **Classes:** Two lectures and two practicals, or one lecture and three practicals per week, 6-day field excursion north-western NSW commencing 15 days prior to beginning of Semester 1 **Prerequisites:** SOIL2003 **Assessment:** One viva voce exam (40%), soil physics written assessments (20%), soil chemistry written assessments (20%), soil judging (12%), pedology written assessments (8%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a theoretical and empirical unit providing specialised training in three important areas of contemporary soil science, namely pedology, soil chemistry and soil physics. The key concepts of these sub-disciplines will be outlined and strengthened by hands-on training in essential field and laboratory techniques. All of this is synthesized by placing it in the context of soil distribution and use in North-Western New South Wales. The unit is motivated by the teaching team's research in this locale. It builds on students, existing soil science knowledge gained in SOIL2003. After completion of the unit, students should be able to articulate the advantages and disadvantages of current field and laboratory techniques for gathering necessary soil information, and simultaneously recognise key concepts and principles that guide contemporary thought in soil science. Students will be able to synthesise soil information from a multiplicity of sources and have an appreciation of the cutting edge areas of soil management and research. By investigating the contemporary nature of key concepts, students will develop their skills in research and inquiry. Students will develop their communication skills through report writing and will also articulate an openness to new ways of thinking which augments intellectual autonomy. Teamwork and collaborative efforts are encouraged in this unit.

Textbooks

Textbooks: D. Hillel. 2004. Introduction to Environmental Soil Physics. Elsevier Science, San Diego, CA, USA, R. Schaetzl and S. Anderson 2005. Soils: Genesis and Geomorphology. Cambridge University Press, New York, NY, USA, D.L. Sparks 2003 Environmental Soil Chemistry (2nd edn). Academic Press, San Diego, CA, USA

SOIL3010
The Soil at Work

Credit points: 6 **Teacher/Coordinator:** Prof Budiman Minasny (Coordinator), Prof Balwant Singh, Prof Alex McBratney, A/Prof. Stephen Cattle, A/Prof Damien Field **Session:** Semester 2 **Classes:** Problem-based unit: each student completes one problem as part of a team, involving multiple team meetings **Prerequisites:** SOIL2003 or SOIL2004 **Assessment:** Introduction to the problem group presentation (10%); status of the problem group report (10%); how to tackle the problem seminar (20%) - team seminars, before fieldwork, analyses done; results seminar (20%) - team seminars; final group report (25%); activities diary for group (15%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a problem-based applied soil science unit addressing the physical, chemical and biological components of soil function. It is designed to allow students to identify soil-related problems in the real-world and by working in a group and with an end-user, to suggest short and long-term solutions to problems such as fertility, resilience, carbon management, structural decline, acidification, salinisation and contamination. By designing and administering strategies to tackle real-world soil issues, students will develop their research and inquiry skills and enhance their intellectual autonomy. By producing reports and seminars that enables understanding by an end-user, students will improve the breadth of their communication skills. This is a core unit for students majoring or specialising in soil science and an elective unit for those wishing to gain an understanding of environmental problem-solving. It utilises and reinforces soil-science knowledge gained in SOIL2003 and SOIL2004, as well as generic problem-solving skills gained during the degree program.

Textbooks

Reference book: I.W.Heathcote 1997. Environmental Problem Solving: A Case Study Approach. McGraw-Hill, New York, NY, USA.

Table F - Other Year 4 electives

AVBS4009
Aquaculture

Credit points: 6 **Teacher/Coordinator:** Dr Joy Becker **Session:** Semester 1 **Classes:** Lectures 2 hours per week, tutorials 1 hour per week, practicals 3 hours per week **Prerequisites:** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3 **Assessment:** Written and/or oral assignments (50%), exam 2.5 hours (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The Unit of Study explores in detail aspects of commercial aquaculture, including global trends in aquaculture development. Other topics include water quality, feeding, management, health and disease, genetics and reproduction, environmental impact and economic constraints to production. The unit of study emphasises methods to improve aquacultural productivity. It builds on basic principles of anatomy, physiology, nutrition, genetics and health and disease presented in other units of study in BAnVetBioSc. At the end of this Unit of Study, students will demonstrate an understanding of the principles of: the context of aquaculture in global food production; husbandry, management and welfare of aquaculture species; comparative aspects of husbandry in aquaria, domestic, commercial; health and disease relevant to aquaculture; nutrition of aquaculture species; reproduction and genetics of species in aquaculture; water quality and environmental impact of aquaculture; economics and marketing of aquaculture products.

AVBS4012
Extensive Animal Industries

Credit points: 6 **Teacher/Coordinator:** A/Prof Russell Bush **Session:** Semester 1 **Classes:** Lectures 3 hours per week, practicals 3 hours per week **Prerequisites:** Animal and Veterinary Bioscience years 1-3 OR Bachelor of Science in Agriculture years 1-3 **Assessment:** Case study (10%), practical report (15%), meat grading (15%), excursion report (20%) and written exam (40%) **Practical field work:** Five-day study tour to the Riverina **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces the concepts of sheep (wool and meat) and beef cattle production in the Australian environment within the context of world food and fibre consumption and production. The key products as well as domestic and export markets for these are presented. The course provides an historical perspective of the basis for each of these industries and describes each of the production systems designed to meet the demand for these products.

Production in both the tropical and temperate regions of Australia will be covered and include the key elements of extensive grazing and intensive feedlot systems. Major issues will include breeds and breeding systems, basic nutrition and production practices and animal welfare issues as they affect the quality and quantity of product marketed.

The concepts of first stage processing of both meat and fibre products in abattoirs and top-making plants respectively will be presented. The major factors that influence the quality of product and therefore grading and market demand will be presented.

Lecture material will be supported with appropriate practical classes and a 5 day study tour to the Riverina to evaluate different commercial production systems. Students will also have an opportunity to compete in the annual Inter Collegiate Meat Judging (ICMJ) competition as a member of the University of Sydney team. This competition involves teams from numerous universities throughout Australia as well as Japan and the USA.

VIRO3001
Virology

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 26 1-hour lectures, seven 4-hour practical classes, one 2-hour tutorial **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3901 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam (60%) (120 minutes). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novel vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluorescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Tutorials cover a range of topical issues and provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

AGEN3008
Indigenous Land and Food Knowledge

Credit points: 6 **Teacher/Coordinator:** Dr Peter Ampt (Coordinator), A/Prof Tina Bell **Session:** Semester 2 **Classes:** Application process, pre-trip orientation - 1 day, field trip Â¿ 10 days + travel time = 70 hours, post-trip workshop - 1 day. (Student financial contribution $2000-$2500) **Assessment:** Assessment during field trip: field trip activities recorded in booklet (20%), journal - personal/reflective (20%), participation peer and self-assessment (10%); assessment post-field trip: one 3000wd feasibility study, funding application and essay due week 7 Semester 2 (50%); Out of class prescribed student workload: application process - Kinship module 1-hour, written application 2-hours. Prepare report Â¿ five hours for seven weeks **Mode of delivery:** Field experience

Note: Department permission required for enrolment. Note: Students must attend pre-trip briefing session (one day in S1 exam period), field trip (approximately two weeks in mid-year break) and post-trip workshop (one day in S2).

This unit of study aims to promote understanding of Indigenous knowledge of land and food both past and present, and develop skills in identifying and developing opportunities for Indigenous engagement in land management and food production. It is an elective unit of study for undergraduate degree students in Science, Business and Arts; and for Honours and Masters degree students in Science and Arts.

This unit of study will explore the importance of the Indigenous estate (the 20-25% of Australia which is under some form of Indigenous land tenure) and will examine Indigenous knowledge to engage with contemporary realities of land management and food production for the sustainability of communities living on country. Emphasis will be on identifying opportunities for economic activities based on land and food management for the communities visited on the field trip.

Students will describe traditional land and food knowledge and understand the complex situation around living on country and the long term trends that are impacting on Indigenous communities. They will participate in activities with community members to identify opportunities for the development of enterprises based on land and food knowledge, then design and develop a plan for an activity that could contribute to the sustainability of the community.

Students will develop cultural competency through engagement with indigenous communities and recognition of the influence of their personal and cultural background through self-reflection. They will develop social research skills in collection and interpretation of qualitative data and the ability to describe a complex social/cultural ecological system and design interventions to improve problem situations. It will also provide students with skills and ideas for future research projects that will engage Indigenous communities and improve partnerships and dialogue.

Textbooks

No prescribed textbook but recommended reading includes: Gammage B (2011) The Biggest Estate on Earth: How Aborigines made Australia, Allen and Unwin, Crows Nest, Sydney, Australia; Svieby K, Skuthorpe T (2006) Treading Lightly: The Hidden Wisdom of the World's Oldest People, Allen and Unwin, Crows nest, Sydney, Australia; Bird Rose D (2000) Dingo Makes us Human: Life and Land in an Australian Aboriginal Culture, Cambridge University Press, Cambridge, UK

AGEN5001
Agricultural and Environmental Extension

Credit points: 6 **Teacher/Coordinator:** Dr Peter Ampt **Session:** Semester 1 **Classes:** One 2-hour lecture per week, one 2-hour tutorial per week, one field trip (three days) **Assessment:** 1500wd essay (20%), tutorial/workshop participation (30%), 3000wd problem based learning project (30%), field trip report (20%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will develop knowledge, skills and understanding for engaging effectively with the people whose decisions shape innovation in agricultural production and environmental management. The role of extension in agricultural and environmental management is a crucial aspect of sustainability, as extension agents provide the main conduit between scientists, economists and policymakers and the people who live and work in the landscape.

It develops key graduate competencies in communication and soft systems for careers including consulting, agribusiness, agricultural extension, environmental management, policy, participatory research and natural resource management. It covers integrative aspects of extension theory and practice, social learning, sustainable agriculture, knowledge domains, participatory action research, human geography, soft systems thinking and adaptive natural resource management. It is relevant to students pursuing agricultural and environmental streams and majors at both undergraduate and postgraduate level.

Students will learn to: describe and discuss the theoretical and practical underpinnings of extension; describe and analyse factors influencing the behaviours, attitudes and beliefs of natural resource managers; discuss and design effective extension programs/projects; conduct, analyse and evaluate simple surveys, focus groups and semi-structured interviews; critically evaluate the integration of conservation and production in the landscape; facilitate sustainable change.

Textbooks

Recommended reading, Jennings, J., Packham R. and Woodside, D.(eds) (2001) Shaping Change APEN; Hay, I (2012) Communicating in Geography and the Environmental Sciences, Oxford

ANSC3107
Animal Genetics 3

Credit points: 6 **Teacher/Coordinator:** Prof Claire Wade **Session:** Semester 2 **Classes:** 2 hours of classes per week where there are no on-line modules, 2 hours per week of practicals. Up to eight weeks of semester will be conducted as on-line learning modules. Students requiring extra assistance are encouraged to make an appointment with Prof Wade. **Prerequisites:** GENE2001 or GENE2002 or GEGE2X01 or MBLG2X72 **Assessment:** Practicals with associated reports and on-line quizzes (25%), mid-semester on-line examination (25%), final examination (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Genetics ANSC3107 is an exciting course that explores the technologies used by geneticists in practical situations involving domestic animals. We will expand on concepts learned in GENE2001 to learn more about genome sequencing, variant discovery, phylogenomics, bioinformatics, epigenetics, association mapping, gene therapy and forensic genetics.

Textbooks

There is no prescribed text for this subject.

AVBS4002
Dairy Production and Technology

Credit points: 6 **Teacher/Coordinator:** Prof Sergio (Yani) Garcia **Session:** Semester 2 **Classes:** Lectures up to 3 hours per week, practicals 3 hours per week **Assumed knowledge:** Enrolled students are expected to have some understanding of key components of the dairy production system, including basic knowledge of animal physiology and nutrition. **Assessment:** Assignment (report or lit review) (30%), pracs assessments, (30%), 1-hour exam (40%) **Practical field work:** At least two half day field trips and one or two full day trips/excursions including commercial farms and a milk processing plant **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the various aspects of dairy farming and the dairy industry from a scientific point of view. The lectures are a mix of the principles on which sound dairy farming is based and practical examples of how this operates in practice. Focus is placed on integrating knowledge to gain understanding on the system of production as a whole. At the end of this unit of study, students will demonstrate a solid understanding of: the characteristics of the dairy industry in Australia and in a world wide context; the key components of pasture-based dairy systems; principles and practices of pasture and feeding management; the application of new technologies to improve efficiency and productivity (particularly automatic milking). In addition, students will demonstrate an appreciation of key aspects of reproduction and lactation physiology; the integration of knowledge of genetics and reproduction into the type of herd improvement structure set up in the dairy industry; the application of ruminant physiology knowledge to developing feeding programs for dairy cows; the extension of basic reproductive physiology onto the dairy farm using case studies as examples; the economics of the dairy farm business. Practical classes include milking cows; grazing and feeding management of dairy cows; calf rearing; and visits to commercial farms ranging from small pasture-based dairy farms to a feed-lot operation milking over 2,000 cows.

Textbooks

Students are advised to consult lecturers for recommended text, scientific and professional articles, technotes for advisors and industry-generated information for farmers

AVBS4008
Intensive Animal Industries

Credit points: 6 **Session:** Semester 2 **Classes:** 6 hours per week **Prerequisites:** (Animal and Veterinary Bioscience years 1-3) OR (Bachelor of Science in Agriculture years 1-3) **Assessment:** Written exam (50%) (poultry and pigs 50:50), in course evaluations and case study - pigs (25%), broiler growth study report and in course evaluations - poultry (25%) **Practical field work:** Visits to an intensive pig/poultry farm, feed mill and poultry production and processing units when biosecurity restrictions allow **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is composed of two parts, a Poultry Production component and a Pig Production component. The course will provide students with a comprehensive overview of the production of eggs and poultry meat and pork. The individual components examine various aspects of the poultry and pig production systems important in maintaining efficiency and profitability. It investigates aspects of breeding, nutrition, housing, growth performance, heath, welfare, reproductive capability, waste management, marketing and current industry issues. This unit will expand on some aspects of previous year 3 units of study in animal structure and function, nutrition and reproduction. There is a broiler growth study which comprises a significant part of the practical work in the Poultry component. There is a strong emphasis on assessment being built into the course work as this is considered to be more relevant to learning in the final year.

Textbooks

There is no single text that adequately covers the Australian pig industry and for this reason no formal text is required.

Bachelor of Science (Veterinary) (pre-2018)

This research degree is only available to students who have completed a minimum of four years of the Bachelor of Veterinary Science from the University of Sydney with a minimum pass grade in all units of study completed to that point.

Bachelor of Science (Veterinary)

Bachelor of Science (Veterinary) (Honours)

These resolutions must be read in conjunction with applicable University By-laws, Rules and policies including (but not limited to) the University of Sydney (Coursework) Rule 2014 (the 'Coursework Rule'), the Coursework Policy 2014, the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended), the Academic Honesty in Coursework Policy 2015 and the Academic Honesty Procedures 2016. Up to date versions of all such documents are available from the Policy Register: http://sydney.edu.au/policies.

Course resolutions

1 Course codes

Code	Course and stream title
BUSCVETE-01	Bachelor of Science (Veterinary)

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Admission to candidature

(1) Available places will be offered to qualified applicants based on merit, according to the following admission criteria.
(2) Admission to candidature requires the completion of a minimum of four years of the Bachelor of Veterinary Science from the University of Sydney with a minimum pass grade in all units of study completed to that point.

4 Requirements for award

(1) The units of study that may be taken for the course are set out in the Table of units of study for the Bachelor of Science (Veterinary) (Honours).
(2) To qualify for the award of the pass degree, a candidate must successfully complete 48 credit points of research units of study.

5 Requirements for the Honours degree

Honours will be awarded to meritorious students who complete the pass degree with a WAM of 65 and above.

6 Award of the degree

(1) The Bachelor of Science (Veterinary) is awarded in the grades of either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Third Class according to the rules specified in the following table:

Description	Mark Range
Honours Class I	Mark >= 80
Honours Class II (Division 1)	75 <= Mark < 80
Honours Class II (Division 2)	70 <= Mark < 75
Honours Class III	65 <= Mark < 70
Honours not awarded	Mark < 65

(2) Candidates who do not obtain WAM of at least 65 will be awarded the pass degree.

7 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2011 and students who commenced their candidature prior to 1 January, 2011 who elect to proceed under these resolutions.
(2) Candidates who commenced prior to 1 January, 2011 may complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that the requirements are completed by 1 January, 2016. The Faculty may specify a later date for completion or specify alternative requirements for completion of candidatures that extend beyond this time.

Table 2: Geoarchaeology

Table 2 lists an optional major available only to students in the pre-2018 Bachelor of Science, the Bachelor of Science (Advanced) and the Bachelor of Science (Advanced Mathematics) who commenced their candidature prior to 1 January, 2018.

Students in all other award courses and combined degrees, eg, Bachelor of Science/Bachelor of Arts, are not eligible for Table 2 majors.

Students in the pre-2018 Bachelor of Science, the Bachelor of Science (Advanced) and the Bachelor of Science (Advanced Mathematics) wishing to complete a Table 2 major are still required to complete a minimum of one Science Table 1 major.

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Geoarchaeology			
For a major in Geoarchaeology, the minimum requirement is 24 credit points from Senior units of study comprising: (i) ARCO3101 and GEOS3103/3803, and (ii) two units of study taken from ARCO3404, ARCO3401, ARCO3402, SOIL3009.			
Senior units of study			
ARCO3101 **Archaeology: History, Theory, Research**	6	**P** 12 credit points at 2000 level in Archaeology **N** ARCA2635	Semester 1
GEOS3103 **Environmental and Sedimentary Geology**	6	**A** (GEOS1003 or GEOS1903) **P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3803	Semester 2
GEOS3803 **Environmental and Sedimentary Geology(Adv)**	6	**A** (GEOS1003 or GEOS1903) **P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3103 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 2
ARCO3404 **Archaeological Fieldwork (Project 4)**	6	**P** 12 credit points at 2000 level in Archaeology	Semester 1 Semester 2 Summer Main
ARCO3401 **Australian Lithic Technology (Project 1)**	6	**P** 12 credit points at 2000 level in Archaeology	Semester 1
ARCO3402 **Archaeozoology (Project 2)**	6	**P** 12 credit points at 2000 level in Archaeology **N** ARCA2641	Semester 2
SOIL3009 **Contemporary Field and Lab Soil Science**	6	**P** SOIL2003	Semester 1

Geoarchaeology

For a major in Geoarchaeology, the minimum requirement is 24 credit points from Senior units of study comprising:(i) ARCO3101 and GEOS3103/3803, and (ii) two units of study taken from ARCO3404, ARCO3401, ARCO3402, SOIL3009.

Senior units of study

ARCO3101
Archaeology: History, Theory, Research

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week. **Prerequisites:** 12 credit points at 2000 level in Archaeology **Prohibitions:** ARCA2635 **Assessment:** 500wd equivalent Lecture Questions (10%), 1x 1500wds Seminar paper (20%), 1x 4000wds Essay (70%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

An introduction to the history of archaeological inquiry in order to illustrate the way theory works, the key theoretical themes and issues of archaeological research and a global perspective on archaeology today.

GEOS3103
Environmental and Sedimentary Geology

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3803 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical reports and quizes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Sediments and sedimentary rocks cover most of the Earth's surface, record much of the Earth's geological and climatic history and host important resources such as petroleum, coal, water and mineral ores. The aim of this unit is to provide students with the skills required to examine, describe and interpret sediments and sedimentary rocks for a variety of different purposes. Specific foci of the unit will be the identification of the recent or ancient environment in which sedimentary materials were deposited, the environmental controls which produce sedimentary structures, and the processes that control the production, movement and storage of sediment bodies. On completion of this unit students will be familiar with the natural processes that produce and modify sediments across a range of environments at the Earth's surface, including fluvial, aeolian, lacustrine, marginal marine and deep marine environments. The various controls on the sedimentary record such as climate and sea-level change, as well as diagenesis and geochemical cycles will also be discussed. Practical exercises will require students to examine global datasets, and determine the properties and significance of sediments and sedimentary rocks. The course is relevant to students interested in petroleum or mineral exploration, environmental and engineering geology as well as marine geoscience.

Textbooks

Course notes will be available from the Copy Centre and an appropriate set of reference texts will be placed on special reserve in the library.

GEOS3803
Environmental and Sedimentary Geology(Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3103 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical, field reports and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3103 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Textbooks

Course notes will be available from the Copy Centre and appropriate set of reference texts will be placed on special reserve in the library.

ARCO3404
Archaeological Fieldwork (Project 4)

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Main **Classes:** 8 hours of lectures, followed by up to two weeks of fieldwork. **Prerequisites:** 12 credit points at 2000 level in Archaeology **Assessment:** 1x 1000 wds Research design proposal (20%), 1x 1000 wds Fieldwork log (20%), 1x 4000 wds Project (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Field experience

This unit provides practical experience in archaeology fieldwork. Students learn site discovery, recording and excavation techniques, and develop a detailed understanding of the practices involved in archaeological fieldwork.

ARCO3401
Australian Lithic Technology (Project 1)

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr laboratory/ week **Prerequisites:** 12 credit points at 2000 level in Archaeology **Assessment:** 1x 1000 wd equivalent Lab notebook (20%), 1x 1000 wd equivalent Practical test (20%), 1x 4000 wds Project (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Production of stone artefacts, lithic technology, is the oldest technology and key to cultural evolution. The unit introduces the technology, and methods and theories for its archaeological interpretation. Understandings are developed through a student project involving laboratory experimentation.

ARCO3402
Archaeozoology (Project 2)

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lab/week **Prerequisites:** 12 credit points at 2000 level in Archaeology **Prohibitions:** ARCA2641 **Assessment:** 1x 2000 wds Research design outline (30%), 1x 4000 wds Major report (70%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

What was the role of animals, both vertebrate and invertebrate, in past economic systems? With a principal emphasis on Australian fauna, we will examine the nature of subsistence strategies, animals as indicators of past environments, and techniques of analysis and interpretation of faunal remains.

SOIL3009
Contemporary Field and Lab Soil Science

Credit points: 6 **Teacher/Coordinator:** Prof Budiman Minasny (Coordinator), Prof Balwant Singh, A/Prof. Stephen Cattle, Prof Alex McBratney, A/Prof Damien Field **Session:** Semester 1 **Classes:** Two lectures and two practicals, or one lecture and three practicals per week, 6-day field excursion north-western NSW commencing 15 days prior to beginning of Semester 1 **Prerequisites:** SOIL2003 **Assessment:** One viva voce exam (40%), soil physics written assessments (20%), soil chemistry written assessments (20%), soil judging (12%), pedology written assessments (8%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a theoretical and empirical unit providing specialised training in three important areas of contemporary soil science, namely pedology, soil chemistry and soil physics. The key concepts of these sub-disciplines will be outlined and strengthened by hands-on training in essential field and laboratory techniques. All of this is synthesized by placing it in the context of soil distribution and use in North-Western New South Wales. The unit is motivated by the teaching team's research in this locale. It builds on students, existing soil science knowledge gained in SOIL2003. After completion of the unit, students should be able to articulate the advantages and disadvantages of current field and laboratory techniques for gathering necessary soil information, and simultaneously recognise key concepts and principles that guide contemporary thought in soil science. Students will be able to synthesise soil information from a multiplicity of sources and have an appreciation of the cutting edge areas of soil management and research. By investigating the contemporary nature of key concepts, students will develop their skills in research and inquiry. Students will develop their communication skills through report writing and will also articulate an openness to new ways of thinking which augments intellectual autonomy. Teamwork and collaborative efforts are encouraged in this unit.

Textbooks

Textbooks: D. Hillel. 2004. Introduction to Environmental Soil Physics. Elsevier Science, San Diego, CA, USA, R. Schaetzl and S. Anderson 2005. Soils: Genesis and Geomorphology. Cambridge University Press, New York, NY, USA, D.L. Sparks 2003 Environmental Soil Chemistry (2nd edn). Academic Press, San Diego, CA, USA

Electives from other faculties

Eligibility

Students may only take electives from other faculties if this is permissible under the course resolutions of their degree or award course. The following table provides a guide to eligibility.

Students are obliged to familiarise themselves with the course resolutions of their degree or award course. Elective units must be selected with regard to course resolutions.

Students should consult the handbooks of other faculties to determine whether they satisfy any prerequisites, corequisites or other requirements relating to enrolment in units of study offered by other faculties.

Degree	Code	Primary units of study	Electives from other faculties
Bachelor of Science	BPSCIENC-02	• Science Units (Table 1)	Maximum 48 credit points of study from outside Science Table 1.
Bachelor of Science (Advanced)	BPSCIENC-02	• Science Units (Table 1)	Maximum 48 credit points of study from outside Science Table 1.
Bachelor of Science (Advanced Mathematics)	BPSCIENC-02	• Science Units (Table 1)	Maximum 48 credit points of study from outside Science Table 1.
Bachelor of Science / Bachelor of Laws	BPSCILAW-01	• Science Units (Table 1) • Law Units (Table II)	None
Bachelor of Medical Science	BPMEDSCI-02	• Medical Science Units (Table IV) • Science Units (Table 1)	Maximum 12 credit points of study from outside Science Table 1 and Science Table IV.
Bachelor of Science / Master of Nutrition and Dietetics	BPSCINUD-01	• BSc/MND Units (Table 1G) • Science Units (Table 1)	Maximum 12 credit points of study from outside Science Table 1 and Science Table 1G.
Bachelor of Science / Bachelor of Arts	BPSCIART-02	• Science Units (Table 1) • Arts Units (Table A)	Maximum 12 credit points of study from outside Science Table 1 and Arts Table A.

Prohibited units

ECMT1010

No student in any degree administered by the Faculty of Science (including those degrees jointly administered by the Faculty of Science and another faculty) is permitted to undertake ECMT1010. No exception is made for any student. ECMT1010 has been deemed mutually exclusive with MATH1005, MATH1015 and MATH1905.

If their degree resolutions allow, students may enrol into ECMT1020 or intermediate Econometrics and Economics units of study. These units are not deemed mutually exclusive with Science Table 1.

Students wishing to complete an Economics major should take one of MATH1005, MATH1015 or MATH1905 in lieu of ECMT1010.

Any BSc/BA or BLAS degree students who have completed ECMT1010 before 2013 will be made an exception. They are permitted to count ECMT1010 towards completion of their degree.

Affected students should seek degree planning advice from the Faculty of Science directly, or, for BLAS degree affected students, should seek degree planning advice from the BLAS degree coordinators – Professor Fiona White (Science stream) and Dr Benjamin Miller (Arts stream).

ECON1003

No student in any degree administered by the Faculty of Science (including those degrees jointly administered by the Faculty of Science and another faculty) shall be permitted to undertake ECON1003. No exception is made for any students. ECON1003 has been deemed mutually exclusive with units in Science Table 1 – namely MATH1111, MATH1011, MATH1001, MATH1901, MATH1906, MATH1021, MATH1921 and MATH1931.

Students wishing to undertake ECON1003 should consider taking one of MATH1111, MATH1011, MATH1021, MATH1921 and MATH1931 instead.

Students in any degree administered by the Faculty of Science who have completed ECON1003 as part of their degree prior to 2014 shall be made an exception. They will be permitted to count ECON1003 towards completion of their degree.

BUSS1020

No student in any degree administered by the Faculty of Science (including those degrees jointly administered by the Faculty of Science and another faculty) shall be permitted to undertake BUSS1020. BUSS1020 has been deemed mutually exclusive with units in Science Table 1 – namely MATH1005, MATH1015 and MATH1905.

Table 1 Overview

Table 1 lists discipline areas and units of study available to students:

a) in Bachelor of Liberals Arts and Sciences and Bachelor of Psychology degrees; or

b) who commenced their candidature in all other Science degrees prior to 1January, 2018 in accordance with their degree resolutions.

Table 1: Anatomy and Histology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Anatomy and Histology			
For a major in Anatomy and Histology, the minimum requirement is 24 credit points from any ANAT, HSTO, EMHU or select NEUR Senior units of study. For a major in Anatomy and Histology (Advanced), the minimum requirement is 24 credit points from any Advanced ANAT, HSTO, EMHU or select NEUR Senior units of study.			
Intermediate units of study			
The completion of 6 credit points of MBLG units of study is highly recommended			
ANAT2008 **Principles of Histology**	6	**A** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
ANAT2009 **Comparative Primate Anatomy**	6	**A** BIOL1XX3 OR BIOL1XX8 **N** ANAT2002	Semester 2
ANAT2010 **Concepts of Neuroanatomy**	6	**A** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **N** ANAT2910 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 2
ANAT2910 **Concepts in Neuroanatomy Adv**	6	**A** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **P** Annual average mark of at least 70 in previous year **N** ANAT2010 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *Note: Department permission required for enrolment*	Semester 2
Senior units of study			
ANAT3006 **Forensic Osteology**	6	**A** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** ANAT2008 and a mark of 65 or above in ANAT2009 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
ANAT3007 **Visceral Anatomy**	6	**A** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **N** ANAT3907 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
ANAT3907 **Visceral Anatomy (Advanced)**	6	**A** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** An annual average mark of 70 or above in previous year **N** ANAT3007 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *Note: Department permission required for enrolment* *DEPARTMENTAL PERMISSION REQUIRED*	Semester 1
HSTO3001 **Microscopy and Histochemistry Theory**	6	**P** ANAT2008 or [BMED2401 and 6cp from (BMED2402, BMED2405, BMED2406)] *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
HSTO3902 **Microscopy and Histochemistry Adv Prac**	6	**P** A mark of 65 or above in ANAT2008 or [BMED2401 and 6cp from (BMED2402, BMED2405, BMED2406)] **C** HSTO3001 **N** HSTO3002 *Note: Department permission required for enrolment* *Departmental Permission required for enrolment.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3005 **Functional Neuroanatomy**	6	**A** [ANAT2010 or ANAT2910 or (BMED2401 and 12 additional credit points of BMED2402, BMED2403, BMED2405, BMED2406) **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3905 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3905 **Functional Neuroanatomy (Advanced)**	6	**A** [ANAT2010 or ANAT2910) or (BMED2401 and 12 additional credit points of BMED240X) **P** Annual average mark of 70 or above in the previous year **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3005 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
ANAT3004 **Cranial and Cervical Anatomy**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **N** ANAT3904 or ANAT3994 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3904 **Cranial and Cervical Anatomy (Advanced)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **N** ANAT3004or ANAT3994 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ANAT3994 **Cranial and Cervical Anatomy (SSP)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01; demonstrated evidence of manual dexterity and ethical approach **P** A mark of 75 or above in ANAT3907 **N** ANAT3904 or ANAT3004 *Note: Department permission required for enrolment* *Department permission required for enrolment. Course is subject to availability of donor material for dissection.Course is by invitation ONLY.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3008 **Musculoskeletal Anatomy**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **N** ANAT3908 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
ANAT3908 **Musculoskeletal Anatomy (Advanced)**	6	**A** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **N** ANAT3008 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
EMHU3001 **Electron Microscopy and Imaging/Theory**	6	**P** 12cp from (ANAT2XXX, BIOL2XXX, BCMB2X0X, CHEM2XXX, GEGE2X01, IMMU2101, MICR2XXX, MBLG2XXX, PCOL201X, PHSI2XXX, PHYS2XXX) or [BMED2401 and 6cp from (BMED2402, BMED2403, BMED2405, BMED2406)] *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
EMHU3002 **Electron Microscopy and Imaging/Prac**	6	**P** ANAT2008 or [BMED2401 and 6cp from (BMED2402, BMED2403, BMED2405, BMED2406)] **C** EMHU3001 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
HSTO3003 **Cells and Development: Theory**	6	**A** ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
HSTO3004 **Cells and Development: Practical (Adv)**	6	**A** (ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **P** An annual average mark of 65 or above in the previous year **C** HSTO3003 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3003 **Cellular and Developmental Neuroscience**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **N** NEUR3903 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3903 **Cellular and Developmental Neurosci. (Adv)**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **P** Annual average mark of 70 or above in the previous year **N** NEUR3003 *Note: Department permission required for enrolment* *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3004 **Integrative Neuroscience**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **N** NEUR3904 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3904 **Integrative Neuroscience (Advanced)**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **P** Annual average mark of 70 or above in the previous year **N** NEUR3004 *Note: Department permission required for enrolment* *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
for other NEUR units, see the Physiology subject area entry in this table			

Anatomy and Histology

For a major in Anatomy and Histology, the minimum requirement is 24 credit points from any ANAT, HSTO, EMHU or select NEUR Senior units of study. For a major in Anatomy and Histology (Advanced), the minimum requirement is 24 credit points from any Advanced ANAT, HSTO, EMHU or select NEUR Senior units of study.

Intermediate units of study

The completion of 6 credit points of MBLG units of study is highly recommended

ANAT2008

Principles of Histology

Credit points: 6 **Teacher/Coordinator:** Dr Laura Lindsay, Dr Samson Dowland **Session:** Semester 1 **Classes:** Two 1-hour lectures **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **Assessment:** One 1-hour theory exam,one 1-hour practical exam, mid-semester exam, theory and practical quizzes (100%) **Practical field work:** One 2-hour practical per week **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers the principles of cell biology and study of the structure of cells, tissues and organ systems at the light and electron microscopic levels. The focus is on human systems. Modern practical applications of histological techniques and analysis for research are also presented.

Textbooks

Paulina, W. Histology - A Text and Atlas. 7th Edition, Lippincott Williams and Wilkins. 2015.

ANAT2009
Comparative Primate Anatomy

Credit points: 6 **Teacher/Coordinator:** Dr Denise Donlon **Session:** Semester 2 **Classes:** Two 1-hour lectures **Prohibitions:** ANAT2002 **Assumed knowledge:** BIOL1XX3 OR BIOL1XX8 **Assessment:** Two quizzes (10%), theory exam (60%), practical exam (30%). **Practical field work:** One 2-hour practical per week **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of student covers the musculo-skeletal anatomy of the human body with particular emphasis on human evolution and comparisons with apes and fossil hominids. The topics covered include the versatility of the human hand, in manipulation and locomotion, bipedalism, climbing and brachiation in apes, and the change in pelvic anatomy associated with bipedalism and obstetric consequences.

Textbooks

Kapit, W and Elson, LM 2014 The Anatomy Coloring Book. Addison-Wesley. 4th edition

ANAT2010
Concepts of Neuroanatomy

Credit points: 6 **Teacher/Coordinator:** Dr Karen Cullen **Session:** Semester 2 **Classes:** two 1-hour lectures per week **Prohibitions:** ANAT2910 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **Assessment:** One theory exam, one practical exam, one mid-semester in-class quiz, periodic online quizzes and written poster presentation **Practical field work:** Tutorials: One 2-hour practical tutorial in 5 sessions during semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students are introduced to the structure and organisation of the central and peripheral nervous system. The course begins with an exploration into the make-up of the individual cells, followed by an examination of the different regions of the nervous system. A final theme of the course touches on the organisation of sensory, motor and integrative systems, together with aspects of higher-order function such as memory and language. The subject covers general concepts of organisation, structure and function of the brain. Tutorial meetings will provide the opportunity to encounter topics in functional anatomy and histology of the brain using photographs, diagrams, models, animations and problem-solving. Topics in identification of central nervous system structure in typical magnetic resonance images will assist in reinforcing the theory of functional anatomy in a format students are likely to encounter in further study and in real-world situations and readings. This course will be of considerable interest to students studying anatomy and related disciplines, as well as those wishing to pursue further study in Neuroscience at senior levels.

Textbooks

Bear, MF, Connors, BW, Paradiso, MA. Neuroscience: Exploring the Brain. 3rd edition. Williams and Wilkins. 2006. Also recommended: Nolte J, Angevine JJB. The Human Brain in Photographs and Diagrams. Mosby/Elsevier. 2007.

ANAT2910
Concepts in Neuroanatomy Adv

Credit points: 6 **Teacher/Coordinator:** Dr Karen Cullen **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 1 x 1hr tutorial **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** ANAT2010 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **Assessment:** one 2-hour theory exam, one 45 min practical exam, one 1200 word critical scientific review article, one mid-semester quiz, three short online quiz-style assignments **Practical field work:** 1 x 1 hr practical **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Students are introduced to the structure and organisation of the central and peripheral nervous system. The course begins with an exploration into the make-up of the individual cells, followed by an examination of the different regions of the nervous system. A final theme of the course touches on the organisation of various systems (sensory and motor), together with aspects of higher-order function such as memory and language. In essence, the subject covers general concepts of organisation, structure and function of the brain. The laboratory practical sessions offer students the special privilege to examine human specimens in the Anatomy labs and museum. Tutorial meetings will provide the opportunity to encounter topics in functional anatomy and histology of the brain using photographs, diagrams, models, animations and problem-solving. Topics in identification of central nervous system structure in typical magnetic resonance images will assist in reinforcing the theory of functional anatomy in a format students are likely to encounter in further study and in real-world situations and readings. This course will be of considerable interest to students studying anatomy and related disciplines, as well as those wishing to pursue further study in Neuroscience at senior levels.

Textbooks

Required text: Bear, M.F., B.W. Connors, M.A. Paradiso. Neuroscience. Exploring the Brain (4th edition) Wolters Kluwer, 2016. Recommended Atlas: Nolte and Angevine. The human brain in photographs and diagrams. 4th edition Philadelphia: Elsevier/Saunders, 2013.

Senior units of study

ANAT3006
Forensic Osteology

Credit points: 6 **Teacher/Coordinator:** Dr Denise Donlon **Session:** Semester 1 **Classes:** Two 1-hour lectures, one 1.5-hour tutorial and one 1.5-hour practical per week **Prerequisites:** ANAT2008 and a mark of 65 or above in ANAT2009 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Quiz 1 (5%), Quiz 2 (5%), Critique/review of journal article (15%), Case study report (20%), Theory exam (30%) Practical exam (25%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce students to the area of forensic osteology, which is the study of human skeletal remains within the legal context. Thus the unit of study aims to help students learn about human morphology and variation through the investigation and identification of human bones. It will also help students gain skills in observation and rigorous record taking and in analysis and interpretation. Production of case reports and practice in acting as 'expert witness' will improve students written and oral skills. An additional objective will be to assist students in learning to deal with legal and ethical issues.

Textbooks

White, T.D. and P.A Folkens, 2005 The Human Bone Manual. Elsevier, NY.

ANAT3007
Visceral Anatomy

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 1 **Classes:** Two 1-hour lectures and two 2-hour tutorials per week. **Prohibitions:** ANAT3907 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) (100%) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to provide an understanding of the anatomy of the viscera of the thorax, abdomen and pelvis. Structures covered include the heart and associated great vessels, lungs, mediastinum and the abdominal viscera, the alimentary organs and the genitourinary system. The structure of anterior thoracic and abdominal walls and pelvis along with the nerve supply to the viscera and relevant endocrine structures is also covered. Emphasis is placed on the relationship of structure to function especially with respect to the important functions of breathing, digestion, excretion and reproduction. Students will be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy.

Textbooks

Rohan, Yokochi and Lutjen-drecoll. Color Atlas of Human Anatomy.

ANAT3907
Visceral Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 1 **Classes:** 2 x 1 hr lectures, 2 x 2 hr tutorials **Prerequisites:** An annual average mark of 70 or above in previous year **Prohibitions:** ANAT3007 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** theory exam, prac exam, continuous assessment (6 quizzes done at intervals during Semester) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy plus further studies of medical images, anatomical features not covered in the mainstream course and details of development of selected head and neck structures. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: DEPARTMENTAL PERMISSION REQUIRED

This unit of study aims to provide an understanding of the anatomy of the viscera of the thorax, abdomen and pelvis. Structures covered include the heart and associated great vessels, lungs, mediastinum and the abdominal viscera, the alimentary organs and the genitourinary system. The structure of anterior thoracic and abdominal walls and pelvis along with the nerve supply to the viscera and relevant endocrine structures is also covered. Emphasis is placed on the relationship of structure to function especially with respect to the important functions of breathing, digestion, excretion and reproduction. Students will be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy. Also further studies of anatomical features not covered in the mainstream course and of details of development of selected head and neck structures.

Textbooks

Rohan, Yokochi and Lutjen-drecoll. Color Atlas of Human Anatomy

HSTO3001
Microscopy and Histochemistry Theory

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold; Prof Christopher Murphy **Session:** Semester 1 **Classes:** Usually four 1-hour lectures per week plus a few tutorials **Prerequisites:** ANAT2008 or [BMED2401 and 6cp from (BMED2402, BMED2405, BMED2406)] **Assessment:** One 2-hour theory exam, essay, mid semester quiz (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aims of this unit of study are to provide a theoretical understanding of why biological tissues need to be specifically prepared for microscopic examination, how differing methods yield different types of morphological information; to allow students to study the theory of different types and modalities of microscopes, how they function and the differing information they provide; to develop an understanding of the theory of why biological material needs to be stained for microscopic examination; to allow students to understand how biological material becomes stained; to develop an understanding of the chemical information provided by biological staining - dyes, enzymes and antibodies.

Textbooks

Keirnan, J.A. Histological and Histochemical Methods. 4th edition. Scion. 2008.

HSTO3902
Microscopy and Histochemistry Adv Prac

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 1 **Classes:** 1 x 1hr tutorials **Prerequisites:** A mark of 65 or above in ANAT2008 or [BMED2401 and 6cp from (BMED2402, BMED2405, BMED2406)] **Corequisites:** HSTO3001 **Prohibitions:** HSTO3002 **Assessment:** one 1.5 hour practical exam, 1 practical report, mid semester quiz **Practical field work:** 1 x 4hr practicals **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Departmental Permission required for enrolment.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aims of this unit of study are to provide a practical understanding of why biological tissues need to be specifically prepared for microscopic examination, how differing methods yield different types of morphological information; to allow students to study the theory of different types and modalities of microscopes, how they function and the differing information they provide; to develop an practical understanding of why biological material needs to be stained for microscopic examination; to allow students to understand how biological material becomes stained; to develop an understanding of the chemical information provided by biological staining - dyes, enzymes and antibodies.

Textbooks

Keirnan, JA. Histological and Histochemical Methods 3rd Edition. Butterworth-Heinmann. 1999

NEUR3005
Functional Neuroanatomy

Credit points: 6 **Teacher/Coordinator:** Dr Paul Austin **Session:** Semester 1 **Classes:** Two one-hour lectures per week, one guest leacture, 3 two-hour seminars **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3905 **Assumed knowledge:** [ANAT2010 or ANAT2910 or (BMED2401 and 12 additional credit points of BMED2402, BMED2403, BMED2405, BMED2406) **Assessment:** One mid-semester practical quiz (in-class), one final theory exam, one final practical exam, 'Neuroscience in the Media' 3 team-based assessment tasks during seminars and 1 individual written assignment **Practical field work:** Weekly 1.5 hour practical class **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of functional neuroanatomy and systems neuroscience, and an appreciation that neuroscience is a constantly evolving field. There will be a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities. The neural circuits and mechanisms that control somatic and autonomic motor systems, motivated behaviours, emotions, and other higher order functions will be explored in great detail based on current neuroscience literature. Practical classes will allow students to identify and learn the functions of critical anatomical structures in human brain and spinal cord specimens. Reading and interpreting images from functional and structural brain imaging techniques will be incorporated into the neuroanatomy practical classes, and develop an appreciation of how these technologies can be used in neuroscience research. The Neuroscience in the Media seminars will develop neuroscience literature searching skills as well as developing critical thinking and analysis of the accuracy of themedia portrayal of neuroscience research. Building on these skills and working in small groups, students will re-frame and communicate neuroscience evidence through the production of a short video. Students will also learn the skills required to write an unbiased and accurate popular media article based on a recent neuroscience research paper. This unit will develop key attributes that are essential for science graduates as they move forward in their careers.

Textbooks

Nolte's. The Human Brain by Todd Vanderah and Douglas Gould. 7th Ed, Elsevier, 2015

The Human Brain in Photographs and Diagrams by John Nolte. 4th Ed, Mosby, 2013

NEUR3905
Functional Neuroanatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Paul Austin **Session:** Semester 1 **Classes:** Two one-hour lectures per week, 8 one-hour seminars **Prerequisites:** Annual average mark of 70 or above in the previous year

Prohibitions: NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3005 **Assumed knowledge:** [ANAT2010 or ANAT2910) or (BMED2401 and 12 additional credit points of BMED240X) **Assessment:** One mid-semester practical quiz (in-class), one final theory exam, one final practical exam, Journal Club participation, Journal Club presentation and 1 individual written assignment **Practical field work:** Weekly 1.5 hour practical class **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of functional neuroanatomy and systems neuroscience, and an appreciation that neuroscience is a constantly evolving field. There will be a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities. The neural circutis and mechanisms that control somatic and autonomic motor systems, motivated behaviours, emotions, and other higher order functions will be explored in great detail based on current neuroscience literature. Practical classes will allow students to identify and learn the functions of critical anatomical structures in human brain and spinal corde specimens. Reading and interpreting images from functional ans tructural brain imaging techniques will be incorporated intot the neuroanatomy practical classes, and develop an appreciation of how these technologies can be used in neuroscience research. By undertaking the advanced unit students will participate in weekly small group seminars under the guidance of a research-active academic. The seminars will take the form of a Journal Club, a style practiced widely in research laboratories around the world. The aim of the Journal Club is to develop critical thinking and detailed knowledge in a specific area of neuroscience research through group discussions. The Journal Club will also develop the skills required to lead a discussion in a small group setting and construct a neuroscience review article. This unit will develop key attributes that are essential for science graduates as they move forward in their careers.

Textbooks

Nolte. Nolte's The Human Brain by Todd. Vanderah and Douglas Gould. 7th Ed, Elsevier, 2015

The Human Brain in Photographs and Diagrams by John Nolte. 4th Ed, Mosby, 2013

ANAT3004
Cranial and Cervical Anatomy

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two 1-hour lectures and two 2-hour tutorials per week **Prerequisites:** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **Prohibitions:** ANAT3904 or ANAT3994 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) (100%) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and CT scans and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Color Atlas of Human Anatomy.

ANAT3904
Cranial and Cervical Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two lectures per week, two hour tutorials per week. **Prerequisites:** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **Prohibitions:** ANAT3004or ANAT3994 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester) **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, also group discussions of features in CT and MR images with a view to understanding cross sectional and living anatomy plus further studies of medical images, anatomical features not covered in the mainstream course and details of development of selected head and neck structures. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. The course also aims to provide both theoretical and practical skills which can provide a basis for further studies in fields such as physiotherapy, chiropractic or forensic science or in post graduate medicine or dentistry or in areas of research requiring a knowledge of anatomy. Also further studies of anatomical features not covered in the mainstream course and of details of development of selected head and neck structures.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Colour Atlas of Human Anatomy.

ANAT3994
Cranial and Cervical Anatomy (SSP)

Credit points: 6 **Teacher/Coordinator:** Ms Robin Arnold **Session:** Semester 2 **Classes:** Two lectures per week, one two hour tutorials per week plus three hours dissection per week **Prerequisites:** A mark of 75 or above in ANAT3907 **Prohibitions:** ANAT3904 or ANAT3004 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01; demonstrated evidence of manual dexterity and ethical approach **Assessment:** Theory exam, prac exam, continuous assessment (6 quizzes done at intervals during semester), continuous assessment tasks in dissection **Practical field work:** Introductory practical talk followed by study of relevant prosections, models, X rays, plus 3 hours dissection per week **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Course is subject to availability of donor material for dissection.Course is by invitation ONLY.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide students with a detailed understanding of the anatomy of the head and neck regions, with a particular emphasis on the functional anatomy of the cranial nerves. This unit of study covers skull, muscles of facial expression, muscles of jaw and neck, ear, eye, nose, oral cavity and larynx and pharynx as well as peripheral distribution of cranial nerves in the head and neck. The functional components of the cranial nerves and their relationship to the special senses and special motor functions such as facial gesture and speech are also studied. The practical sessions aim to provide students with the ability to recognise the structures studied in human prosections and in medical images especially X Rays and to know their main anatomical relationships. Students will also be encouraged to relate their understanding of these structures to current research in anatomy and histology and in related fields such as molecular biology and physiology. Dissection activities further the understanding of the anatomy of the head and neck and develop highly advanced skills in dissection and prosection of cadaveric materials.

Textbooks

Rohan, Yokochi, Lutjen-Drecoll. Colour Atlas of Human Anatomy.

ANAT3008
Musculoskeletal Anatomy

Credit points: 6 **Teacher/Coordinator:** Dr Richard Ward **Session:** Semester 2 **Classes:** Two 1-hour lectures, two 2-hour tutorials per week **Prerequisites:** 12cp (from ANAT2XXX, PHSI2XXX, MEDS 2XXX, PSYC2XXX or BIOL2XXX) or (BMED2401 and BMED2402) **Prohibitions:** ANAT3908 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 90 minute paper (70%), one 60 minute paper (30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The unit provides an opportunity for students to study the topographical and systems anatomy of the upper limb, lower limb and the back regions. Emphasis is placed upon the identification and description of structures and the correlation of structure with function. This includes for the upper limb, its role in manipulation, for the lower limb standing and walking and for the back flexible support and protection. Emphasis is also given to the innervation of the limbs. The unit also aims to develop the general skills of observation, description, drawing, writing and discussion as applying to biological structure.

ANAT3908
Musculoskeletal Anatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Richard Ward **Session:** Semester 2 **Classes:** 2 x 1hr lectures **Prerequisites:** A mark of 65 or above in [ANAT200X or (BMED2401 and BMED2402)] **Prohibitions:** ANAT3008 **Assumed knowledge:** Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 90 minute paper(70%), one practical examination (30%) **Practical field work:** 2 x 2hr Anatomy Wetlab Laboratories **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study aims to provide an opportunity for students to study the topographical and systems anatomy of the upper limb, lower limb and the back regions. Emphasis is placed upon the identification and description of structures and the correlation of structure with function, which for the upper limb includes its role in manipulation, for the lower limb standing and walking and for the back flexible support and protection. Emphasis is also given to the innervation of the limbs and the consequences of nerve lesions for limb function. The unit also aims to develop the general skills of observation, description, drawing, writing and discussion as applying to biological structure. The unit builds upon or compliments other macroscopic anatomy units offered by the Department and provides for the development of skills, which could be relevant to a later honours project or higher degree in the field of structural biology.

EMHU3001
Electron Microscopy and Imaging/Theory

Credit points: 6 **Teacher/Coordinator:** Dr Suzanne Ollerenshaw **Session:** Semester 2 **Classes:** Four 1-hour lectures per week **Prerequisites:** 12cp from (ANAT2XXX, BIOL2XXX, BCMB2X0X, CHEM2XXX, GEGE2X01, IMMU2101, MICR2XXX, MBLG2XXX, PCOL201X, PHSI2XXX, PHYS2XXX) or [BMED2401 and 6cp from (BMED2402, BMED2403, BMED2405, BMED2406)] **Assessment:** One 2hr exam (45%) and in semester assessment (55%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The course is run conjointly by the Department of Anatomy and Histology and the Australian Centre for Microscopy and Microanalysis (ACMM). The course will focus on the theoretical aspects of transmission and scanning electron microscopy, the preparation of biological samples for electron microscopy, digital imaging, MicroCT and CryoEM. Students will receive theoretical training in laser scanning confocal microscopy including the use of fluorescent probes to visualize cellular organelles and cellular processes. Immunological and other techniques required in modern research and hospital electron microscope laboratories will also be covered. Students will undertake a theoretical research project of their choice which is of relevance to the course.

Textbooks

Bozzola, JJ, Russell LD. Electron Microscopy. 2nd edition. Jones and Bartlett Publishers. 1999. Reference book: Russ, John C. The Image Processing Handbook. 3rd edition. CRC Press. 1998.

EMHU3002
Electron Microscopy and Imaging/Prac

Credit points: 6 **Teacher/Coordinator:** Dr Suzanne Ollerenshaw **Session:** Semester 2 **Classes:** Two 2-hour practicals per week **Prerequisites:** ANAT2008 or [BMED2401 and 6cp from (BMED2402, BMED2403, BMED2405, BMED2406)] **Corequisites:** EMHU3001 **Assessment:** One exam and in-semester assessment of practical book exercises, practical report, practical project assignment by powerpoint submission and oral presentation (100%) **Practical field work:** Two 2-hour practicals per week **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The course is run conjointly by the Department of Anatomy and Histology and the Australian Centre for Microscopy and Microanalysis (ACMM). The course will provide hands-on training in the operation of transmission and scanning electron microscopes, processing biological samples for electron microscopy, ultrathin sectioning, cryo-ultramicrotomy, electron diffraction, digital imaging, immunological and other techniques required in modern research and hospital electron microscope laboratories. Students will also learn the operation of laser scanning confocal microscopes, including the use of fluorescent probes to visualise cellular organelles and cellular processes. Students will apply their knowledge to complete a project of their choice on electron microscopy of a biological sample, from fixation of the sample to interpretation of the resulting electron micrographs.

Textbooks

Bozzola, JJ and Russell, LD. Electron Microscopy. 2nd edition. Jones and Bartlett Publishers. 1999.

HSTO3003
Cells and Development: Theory

Credit points: 6 **Teacher/Coordinator:** Prof Frank Lovicu **Session:** Semester 2 **Classes:** Four to five 1-hour theory lectures and/or one 1-hour tutorial per week **Assumed knowledge:** ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** One 2-hour exam, tutorial research papers and Seminar (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The main emphasis of this unit of study concerns the mechanisms that control animal development. Early developmental processes including fertilisation, cleavage, and gastrulation leading to the formation of the primary germ layers and subsequent body organs are described in a range of animals, mainly vertebrates. Stem cells of both embryonic and adult origin will be covered. Emphasis will be placed on the parts played by inductive cell and tissue interactions in cell and tissue differentiation, morphogenesis and pattern formation. This will be studied at both cellular and molecular levels.

Textbooks

Gilbert, SF. Developmental Biology. 11th edition. Sinauer Associates Inc. 2016.

HSTO3004
Cells and Development: Practical (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 2 **Prerequisites:** An annual average mark of 65 or above in the previous year **Corequisites:** HSTO3003 **Assumed knowledge:** (ANAT2008 or BMED2401) and Human biology; BIOL1XX8 or BIOL1XX3 or MEDS1X01 **Assessment:** Practical class reports and Seminars (100%) **Practical field work:** Two 3-hour practicals per week **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This advanced unit of study complements HSTO3003 (Cells and Development: Theory) and is catered to provide students with laboratory research experience leading to Honours and higher degrees. It will primarily cover the design and application of experimental procedures involved in cell and developmental biology, using appropriate molecular and cellular techniques to answer developmental questions raised in HSTO3003. This unit of study will promote hands on experience, allowing students to observe and examine developing and differentiating tissues at the macroscopic and microscopic level. The main emphasis of this unit of study will concentrate on practical approaches to understanding the mechanisms that control animal development. Some projects may examine early developmental processes such as fertilization, cleavage, gastrulation and the formation of the primary germ layers and tissues. The parts played by stem cells and inductive cell and tissue interactions in differentiation, morphogenesis and pattern formation can also be examined at cellular and molecular levels.

Textbooks

Gilbert SF. Developmental Biology. 10th edition. Sinauer Associates Inc. 2013.

NEUR3003
Cellular and Developmental Neuroscience

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Three 1-hour lectures plus one 1-hour tutorial per week. **Prohibitions:** NEUR3903 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Final exam. Mid-semester exam, Major essay/report, attendance and particpation in assessment of Advanced student presentations (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This second semester unit is designed to introduce students to "cutting edge" issues in the neurosciences. This course is a combination of small lectures on current issues in cellular and developmental neuroscience and a research-based library project. Issues covered in the lecture series will include the role of glial on cerebral blood flow and neural transmission, neurochemistry and psychiatric disorders and the development of central and peripheral nervous systems.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition. Elsevier. 2000.

NEUR3903
Cellular and Developmental Neurosci. (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Three 1-hour lectures and one 2-hour lab session per week. **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3003 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Final exam. Mid-semester exam, Mini-lecture presentation and resources, Attendance at and participation in assessment of advanced student presentations (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit encompasses the material taught in NEUR3003. Advanced students perform a research project and present a mini-lecture on a current topic in neuroscience.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition. Elsevier. 2000.

NEUR3004
Integrative Neuroscience

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** One 1-hour lecture, one 2-hour tutorial per week. **Prohibitions:** NEUR3904 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Mid-semester exam, Final exam, 3 short in-semester assessments/reports, Tutorial participation, attendance and at participation in assessment of Advanced student presentations (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This second semester unit is designed to introduce students to "cutting edge" issues in the neurosciences and to be taken in conjunction with NEUR3003. This course is a combination of small group lectures on current issues in neuroscience, seminar groups and a research-based library project. Seminars will be held on topics including imaging pain, emotions, cortical development and plasticity, colour vision, stroke and hypertension, and long-term regulation of blood pressure.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition.

NEUR3904
Integrative Neuroscience (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Up to one 1-hour lecture, one 2-hour tutorial and one two hour laboratory session per week on average. **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3004 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Mid-semester exam, Final exam, Major essay/report, Tutorial participation, Attendance at and participation in assessment of advanced student presentations (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit encompasses the material taught in NEUR3004. Advanced students perform a research project and present a mini-lecture on a current topic in neuroscience research.

BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition.

for other NEUR units, see the Physiology subject area entry in this table

Table 1: Applied Medical Science

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Applied Medical Science			
For a major in Applied Medical Science, the minimum requirement is 24 credit points from any AMED Senior units of study.			
Intermediate units of study			
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
Senior units of study			
AMED3001 **Cancer**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
AMED3002 **Interrogating Biomedical and Health Data**	6	**A** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
AMED3003 **Diagnostics and Biomarkers**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
AMED3004 **Clinical Science**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Applied Medical Science

For a major in Applied Medical Science, the minimum requirement is 24 credit points from any AMED Senior units of study.

Intermediate units of study

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1 **Assessment:** Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks

Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

Senior units of study

AMED3001
Cancer

Credit points: 6 **Teacher/Coordinator:** Assoc Prof Scott Byrne **Session:** Semester 1 **Classes:** interactive face to face activities 4 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, assignments, quiz, presentation **Campus:** Westmead, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

What does it mean when someone tells you: "you have cancer"? Initially you're probably consumed with questions like: "how did this happen?" and "will this cancer kill me?". In this unit, we will explore all aspects of the "cancer problem" from the underlying biomedical and environmental causes, through to emerging approaches to cancer diagnosis and treatment. You will integrate medical science knowledge from a diverse range of disciplines and apply this to the prevention, diagnosis and treatment of cancer both at the individual and community level. Together we will explore the epidemiology, aetiology and pathophysiology of cancer. You will be able to define problems and formulate solutions related to the study, prevention and treatment of cancer with consideration throughout for the economic, social and psychological costs of a disease that affects billions. Face-to-face and online learning activities will allow you to work effectively in individual and collaborative contexts. You will acquire the skills to interpret and communicate observations and experimental findings related to the "cancer problem" to diverse audiences. Upon completion, you will have developed the foundations that will allow you to follow a career in cancer research, clinical and diagnostic cancer services and/or the corporate system that supports the health care system.

Textbooks

Recommended Textbook: 1.,Weinberg (2013) The Biology of Cancer. 2nd edition. Garland Science Recommended reading: 1.,Hanahan and Weinberg (2000). The hallmarks of cancer. Cell 100, 57-70. 2.,Hanahan and Weinberg (2011). Hallmarks of cancer: the next generation. Cell 144, 646-74

AMED3002
Interrogating Biomedical and Health Data

Credit points: 6 **Teacher/Coordinator:** Prof Jean Yang **Session:** Semester 1 **Classes:** face to face 5 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assumed knowledge:** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. **Assessment:** in-semester exam, assignments, presentation **Campus:** Westmead, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Biotechnological advances have given rise to an explosion of original and shared public data relevant to human health. These data, including the monitoring of expression levels for thousands of genes and proteins simultaneously, together with multiple databases on biological systems, now promise exciting, ground-breaking discoveries in complex diseases. Critical to these discoveries will be our ability to unravel and extract information from these data. In this unit, you will develop analytical skills required to work with data obtained in the medical and diagnostic sciences. You will explore clinical data using powerful, state of the art methods and tools. Using real data sets, you will be guided in the application of modern data science techniques to interrogate, analyse and represent the data, both graphically and numerically. By analysing your own real data, as well as that from large public resources you will learn and apply the methods needed to find information on the relationship between genes and disease. Leveraging expertise from multiple sources by working in team-based collaborative learning environments, you will develop knowledge and skills that will enable you to play an active role in finding meaningful solutions to difficult problems, creating an important impact on our lives.

AMED3003
Diagnostics and Biomarkers

Credit points: 6 **Teacher/Coordinator:** Dr Fabienne Brilot-Turville **Session:** Semester 2 **Classes:** interactive face to face 4 hrs/week; online activities 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, skill based assessments, presentation **Campus:** Westmead, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Diagnostic sciences have evolved at a rapid pace and provide the cornerstone of our health care system. Effective diagnostic assays enable the identification of people who have, or are at risk of, a disease, and guide their treatment. Research into the pathophysiology of disease underpins the discovery of novel biomarkers and in turn, the development of revolutionary diagnostic assays that make use of state-of-the-art molecular and cellular methods. In this unit you will explore a diverse range of diagnostic tests and gain valuable practical experience in a number of core diagnostic methodologies, many of which are currently used in hospital laboratories. Together we will also cover the regulatory, social, and ethical aspects of the use of biomarkers and diagnostic tests and explore the pathways to their translation into clinical practice. By undertaking this unit, you will develop your understanding of diagnostic assays and biomarkers and acquire the skills needed to embark on a career in diagnostic sciences.

AMED3004
Clinical Science

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Gold **Session:** Semester 2 **Classes:** interactive face to face 4 hrs/week; online activities 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, skill based assessment, assignments **Campus:** Westmead, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Clinical science is a multidisciplinary science that combines the principles of experimental science with translational medicine. As a clinical scientist, you will have the capacity to interpret test results, isolate causes of disease, and ultimately develop new treatments that will save lives. Clinical Science will provide you with the breadth and depth of knowledge and skills that will give you a broad foundation of knowledge and open up a range of career opportunities in clinical sciences, including medical research, pharmaceutical development and clinical diagnostics. You will learn the language of the clinical world as you develop expertise in literature searching, study design, data interrogation and interpretation, evidence-based decision-making, and current knowledge in medical research. You will explore how discoveries in the medical sciences are translated into clinical practice, and pose your own clinical questions for investigation. You will study important medical conditions from the areas of infectious and genetic diseases and immunity. The capstone experience of your study in Clinical Science will be a short internship in a sector of the clinical sciences of your interest, such as a diagnostic lab, a research lab or a clinical trials centre.

Table 1: Biochemistry

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Biochemistry			
For a major in Biochemistry, the minimum requirement is 24 credit points from senior units of study listed in this subject area.			
Junior units of study			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Intermediate units of study			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
BCMB2002 **Proteins in Cells**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2902	Semester 2
BCMB2902 **Proteins in Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2002	Semester 2
Senior units of study			
BCHM3071 **Molecular Biology and Biochemistry-Genes**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3971 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3971 **Molecular Biology and Biochem-Genes (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3071 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3081 **Mol Biology and Biochemistry-Proteins**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3981 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3981 **Mol Biology and Biochem-Proteins (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3081 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3072 **Human Molecular Cell Biology**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3972 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3972 **Human Molecular Cell Biology (Advanced)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3072 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BCHM3082 **Medical and Metabolic Biochemistry**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3982 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3982 **Medical and Metabolic Biochemistry (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3082	Semester 2
BCHM3092 **Proteomics and Functional Genomics**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3992 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3992 **Proteomics and Functional Genomics (Adv)**	6	**P** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3092 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NUTM3001 **Introductory Nutrition and Metabolism**	6	**A** PHSI2X05 and PHSI2X06 **P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Biochemistry

For a major in Biochemistry, the minimum requirement is 24 credit points from senior units of study listed in this subject area.

Junior units of study

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of

BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks

Please see unit outline on LMS

Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

Intermediate units of study

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901
Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2002
Proteins in Cells

Credit points: 6 **Teacher/Coordinator:** Dr Sandro Ataide **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; one 4-hour practical/tutorial session per week **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2071 or BCHM2971 or BCMB2902 **Assessment:** Assignments, skills-based assessment, quiz, final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

A single human cell contains billions of protein molecules that are constantly in motion. Why so many? What are they doing? And, how are they doing it? In simple terms, proteins define the function of and drive almost every process within cells. In this unit of study you will learn about the biochemistry of proteins in their natural environment - within cells - with a focus on eukaryotes including plant and other cell types. You will discover the dynamic interplay within and between proteins and other cellular components and how the physical properties of proteins dictate function. You will discover how proteins are compartmentalized, modified, folded, transported in and between cells, the mechanisms by which proteins regulate biological activities, interact and transport molecules across membranes, and how mutations in proteins can lead to pathological consequences. Our practicals, other guided and online learning sessions will introduce you to a wide range of currently utilised techniques for protein biochemistry ranging from protein visualization, quantification, purification and enzymatic activity, to in silico studies and cellular targeting experiments. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the cellular and molecular biosciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2902
Proteins in Cells (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Sandro Ataide **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; one 4-hour practical/tutorial session per week **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2071 or BCHM2971 or BCMB2002 **Assessment:** Assignment, skills-based assessment, quiz, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

A single human cell contains billions of protein molecules that are constantly in motion. Why so many? What are they doing? And, how are they doing it? In simple terms, proteins define the function of and drive almost every process within cells. In this unit of study you will learn about the biochemistry of proteins in their natural environment - within cells - with a focus on eukaryotes including plant and other cell types. You will discover the dynamic interplay within and between proteins and other cellular components and how the physical properties of proteins dictate function. You will discover how proteins are compartmentalized, modified, folded, transported in and between cells, the mechanisms by which proteins regulate biological activities, interact and transport molecules across membranes, and how mutations in proteins can lead to pathological consequences. There will be a research-focused approach to the advanced practical component, including real and virtual extensions to key experiments. This approach will continue in the lecture series with several unique advanced lectures covering current research topics. You will further investigate a selected area of interest from these topics using original source material and present your findings through an oral presentation in dedicated advanced tutorials.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

Senior units of study

BCHM3071
Molecular Biology and Biochemistry-Genes

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3971 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester practical work and assignments (30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3971
Molecular Biology and Biochem-Genes (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3071 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

The lecture component of this unit of study is the same as BCHM3071. Qualified students will attend seminars/practical classes in which more sophisticated topics in gene expression and manipulation will be covered.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3081
Mol Biology and Biochemistry-Proteins

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Prof Joel Mackay **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3981 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the functions of proteins in living organisms, with a focus on eukaryotic and particularly human systems. Its lecture component deals with how proteins adopt their biologically active forms, including discussions of protein structure, protein folding and how recombinant DNA technology can be used to design novel proteins with potential medical or biotechnology applications. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of proteins. It also covers physiologically and medically important aspects of proteins in living systems, including the roles of chaperones in protein folding inside cells, the pathological consequences of misfolding of proteins, how proteins are sorted to different cellular compartments and how the biological activities of proteins can be controlled by regulated protein degradation. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology and protein biochemistry laboratories.

Textbooks

Williamson M. How Proteins Work. Garland. 2012.

BCHM3981
Mol Biology and Biochem-Proteins (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Prof Joel Mackay **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3081 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the functions of proteins in living organisms, with a focus on eukaryotic and particularly human systems. Its lecture component deals with how proteins adopt their biologically active forms, including discussions of protein structure, protein folding and how recombinant DNA technology can be used to design novel proteins with potential medical or biotechnology applications. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of proteins. It also covers physiologically and medically important aspects of proteins in living systems, including the roles of chaperones in protein folding inside cells, the pathological consequences of misfolding of proteins, how proteins are sorted to different cellular compartments and how the biological activities of proteins can be controlled by regulated protein degradation. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology and protein biochemistry laboratories.

The lecture component of this unit of study is the same as BCHM3081. Qualified students will attend seminars/practical classes in which more sophisticated topics in protein biochemistry will be covered.

Textbooks

Williamson M. How Proteins Work. Garland. 2012.

BCHM3072
Human Molecular Cell Biology

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3972 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BCHM3972
Human Molecular Cell Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3072 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

The lecture component of this unit of study is the same as BCHM3072. Qualified students will attend seminars/practical classes in which more sophisticated topics in modern molecular cell biology will be covered.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BCHM3082
Medical and Metabolic Biochemistry

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3982 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with molecular biology methods and studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry.

BCHM3982
Medical and Metabolic Biochemistry (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3082 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with new methods, including magnetic resonance techniques and molecular biology methods, as well as studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry. Qualified students will attend some lectures/practical classes in common with BCHM3082 and some separate lectures/ practical classes in which more sophisticated topics in metabolic biochemistry will be covered.

BCHM3092
Proteomics and Functional Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Stuart Cordwell, Jill Johnston **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and one 3-hour practical per week. **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3992 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will focus on the high throughput methods for the analysis of gene structure and function (genomics) and the analysis of proteins (proteomics), which are at the forefront of discovery in the biomedical sciences. The course will concentrate on the hierarchy of gene-protein-structure-function through an examination of modern technologies built on the concepts of genomics versus molecular biology, and proteomics versus biochemistry. Technologies to be examined include DNA sequencing, nucleic acid and protein microarrays, two-dimensional gel electrophoresis of proteins, uses of mass spectrometry for high throughput protein identification, isotope tagging for quantitative proteomics, high-performance liquid chromatography, high-throughput functional assays, affinity chromatography and modern methods for database analysis. Particular emphasis will be placed on how these technologies can provide insight into the molecular basis of changes in cellular function under both physiological and pathological conditions as well as how they can be applied to biotechnology for the discovery of biomarkers, diagnostics, and therapeutics. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in proteomics and genomics.

BCHM3992
Proteomics and Functional Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Stuart Cordwell, Jill Johnston **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and one 3-hour practical per fortnight. **Prerequisites:** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3092 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will focus on the high throughput methods for the analysis of gene structure and function (genomics) and the analysis of proteins (proteomics) which are at the forefront of discovery in the biomedical sciences. The course will concentrate on the hierarchy of gene-protein-structure-function through an examination of modern technologies built on the concepts of genomics versus molecular biology, and proteomics versus biochemistry. Technologies to be examined include DNA sequencing, nucleic acid and protein microarrays, two-dimensional gel electrophoresis of proteins, uses of mass spectrometry for high throughput protein identification, isotope tagging for quantitative proteomics, high-performance liquid chromatography, high-throughput functional assays, affinity chromatography and modern methods for database analysis. Particular emphasis will be placed on how these technologies can provide insight into the molecular basis of changes in cellular function under both physiological and pathological conditions as well as how they can be applied to biotechnology for the discovery of biomarkers, diagnostics, and therapeutics. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in proteomics and genomics.

The lecture component of this unit of study is the same as BCHM3092. Qualified students will attend seminars/practical classes in which more sophisticated topics in proteomics and genomics will be covered.

NUTM3001
Introductory Nutrition and Metabolism

Credit points: 6 **Teacher/Coordinator:** Wendy Stuart-Smith **Session:** Semester 1 **Classes:** Two lectures, one tutorial per week, 1-5hour laboratory/presentation class most weeks **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Assumed knowledge:** PHSI2X05 and PHSI2X06 **Assessment:** In semester reports, presentations and quizzes (40%) one 2.5-hour exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Nutrition is a multidisciplinary science that covers the role of food in health and disease. Advances in biomolecular science have increased the focus of nutrition on the metabolic pathways that transform nutrients. This unit of study aims to explore fundamentals in nutritional science to develop an understanding of the core concepts in human nutrition through exploring the role of macro- and micro-nutrients and their interaction across the lifespan, mostly in the healthy individual. The focus will be the biochemical reactions that take place in cells, how these are influenced by different nutrients and what are the implications for the whole body. This unit of study will consider the structure and chemical characteristics of nutrients, their metabolism, and their roles in health and disease. This unit of study will explore how animal models, cell culture techniques and human trials have contributed to advancing nutritional science. Examples from current research will be used to illustrate how nutrients are metabolised, mostly in health, and the expanding scope of research in human nutrition.

Textbooks

Essentials of Human Nutrition 4th Edition, 2012. Edited by Jim Mann and A. Stewart Truswell. Oxford University Press. ISBN: 9780199566341*

Table 1: Bioinformatics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Bioinformatics			
For a major in Bioinformatics, students must complete a minimum of 24 credit points from senior units of study in the Life Sciences, Statistics, and Information Technologies, including:- (i) At least one of BIOL3018/3918, BIOL3026/3926, BIOL3044/3944, BCHM3092/3992; and (ii) At least one of STAT3012/3912 and STAT3014/3914; and (iii) Either COMP3520 or (by departmental permission INFO3911 or INFO3912); and (iv) BINF3101			
For further information on how to prepare for a major in Bioinformatics, please consult the Faculty of Science's [[http://sydney.edu.au/science/fstudent/undergrad/course/||webpage]])			
Bioinformatics major (A) units of study			
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1
BIOL3918 **Gene Technology and Genomics (Adv)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **N** BIOL3018	Semester 1
BIOL3026 **Developmental Genetics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **N** BIOL3926	Semester 2
BIOL3926 **Developmental Genetics (Advanced)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **N** BIOL3929 or BIOL3026	Semester 2
BIOL3044 **Evolution and Biodiversity**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3944 or BIOL3025 or BIOL3925 or PLNT3003 or PLNT3903	Semester 1
BIOL3944 **Evolution and Biodiversity (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3044 or BIOL3025 or BIOL3925 or PLNT3003 or PLNT3903	Semester 1
BCHM3092 **Proteomics and Functional Genomics**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3992 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3992 **Proteomics and Functional Genomics (Adv)**	6	**P** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3092 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
Bioinformatics major (B) units of study			
STAT3012 **Applied Linear Models**	6	**P** (DATA2002 or STAT2X12) and (MATH1X02 or MATH1014) **N** STAT3002 or STAT3004 or STAT3902 or STAT3912 or STAT3904	Semester 1
STAT3912 **Applied Linear Models (Advanced)**	6	**P** [STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002)] and (MATH2X61 or MATH1902 or MATH2X22) **N** STAT3012 or STAT3002 or STAT3902 or STAT3004 or STAT3904	Semester 1
STAT3014 **Applied Statistics**	6	**A** STAT3012 or STAT3912 **P** DATA2002 or STAT2X12 **N** STAT3914 or STAT3002 or STAT3902 or STAT3006	Semester 2
STAT3914 **Applied Statistics Advanced**	6	**A** STAT3912 **P** STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002) **N** STAT3014 or STAT3907 or STAT3902 or STAT3006 or STAT3002	Semester 2
Bioinformatics major (C) unit of study			
COMP3520 **Operating Systems Internals** *This unit of study is not available in 2018*	6	**P** COMP2129	Semester 1
INFO3911 **IT Special Project 3A**	6	**P** [85% average in IT units of study in previous year] AND [Permission from the School of IT] *Note: Department permission required for enrolment* *Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units*	Semester 1
INFO3912 **IT Special Project 3B**	6	**P** [85% average in IT units of study in previous year] AND [Permission from the School of IT] *Note: Department permission required for enrolment* *Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Bioinformatics major (D) unit of study			
BINF3101 **Bioinformatics Project**	6	**A** INFO2110 and (INFO1103 or INFO1903) **P** 12cp from (BIOL2XXX or MBLG2XXX or BCMB2XXX or GEGE2XXX or BCHM2XXX or MICR2XXX or PCOL2XXX or QBIO2XXX or ENVX2XXX or DATA2002 or GENE2002) **N** COMP3206 or BINF3001 or INFO3600 or SOFT3300 or SOFT3600 or SOFT3200 or SOFT3700	Semester 2

Bioinformatics

For a major in Bioinformatics, students must complete a minimum of 24 credit points from senior units of study in the Life Sciences, Statistics, and Information Technologies, including:-(i) At least one of BIOL3018/3918, BIOL3026/3926, BIOL3044/3944, BCHM3092/3992; and(ii) At least one of STAT3012/3912 and STAT3014/3914; and(iii) Either COMP3520 or (by departmental permission INFO3911 or INFO3912); and(iv) BINF3101For further information on how to prepare for a major in Bioinformatics, please consult the Faculty of Science's [[http://sydney.edu.au/science/fstudent/undergrad/course/||webpage]])

Bioinformatics major (A) units of study

BIOL3018
Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

BIOL3918
Gene Technology and Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **Prohibitions:** BIOL3018 **Assessment:** One 2-hour exam (60%), assignments (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of BIOL3018 Gene Technology and Genomics. The content and nature of these components may vary from year to year.

BIOL3026
Developmental Genetics

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **Prohibitions:** BIOL3926 **Assessment:** One 2-hour exam, assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Developmental genetics discusses major concepts and our current understanding of developmental biology with an emphasis on molecular genetics. The developmental genetics of animal and plant systems will be investigated, along with approaches used to determine gene function in relation to development of complex multicellular organisms. Topics include the features and resources for model organisms; the generation of mutants for forward and reverse genetics; the application of mutants to the study gene function and gene networks; spatial and temporal gene expression in pattern formation; quantitative trait loci analysis; utility of genome wide association studies; epigenetics in relation to inheritance; genome information in the study of human genetics. Reference will be made to the use of modern techniques in developmental biology such as transgenics, recombinant DNA technology, tissue-specific expression analysis. Various methods of genetic mapping will be covered. Practical work complements the theoretical aspects of the course and develops important skills in genetics.

BIOL3926
Developmental Genetics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **Prohibitions:** BIOL3929 or BIOL3026 **Assessment:** One 2-hour exam, assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components to BIOL3026 Developmental Genetics. The content and nature of these components may vary from year to year. Some assessment will be in an alternative format to components of BIOL3026.

BIOL3044
Evolution and Biodiversity

Credit points: 6 **Teacher/Coordinator:** Prof Ben Oldroyd **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3944 or BIOL3025 or BIOL3925 or PLNT3003 or PLNT3903 **Assessment:** Practical reports and/or presentations (60%), one 2-hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

How did the diversity of life arise? Why are there so many species? Why do animals and plants seem so well designed for their environments? How do we explain patterns of distribution across continents? These are some of the key questions that we will examine in this Unit. The Unit begins with a survey of the history of evolutionary thought, and the so-called 'new synthesis'; the melding of Darwinian evolution, systematics and genetics. The Unit will provide training in the principles, methods, and applications of evolutionary biology including systems of classification, the genetics of speciation and hybrid zones, molecular evolution, reconstruction of phylogenies, population genetics, historical interpretation of geographic distributions, evolution of sex, adaptation, human evolution, and selfish gene theory. Examples from a broad range of organisms and data sources will be used throughout the Unit. This Unit is valuable for students who intend to seek employment in areas such as biodiversity research, bioinformatics, ecology, taxonomy, biological conservation and teaching.

Textbooks

Freeman and Herron (2011) Evolutionary Analysis, Pearson/Prentice Hall

BIOL3944
Evolution and Biodiversity (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Ben Oldroyd **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3044 or BIOL3025 or BIOL3925 or PLNT3003 or PLNT3903 **Assessment:** Practical reports and/or presentations (60%), one 2-hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content will be based on the standard unit BIOL3044 but qualified students will participate in alternative components at a more advanced level. How did the diversity of life arise? Why are there so many species? Why do animals and plants seem so well designed for their environments? How do we explain patterns of distribution across continents? These are some of the key questions that we will examine in this Unit. The Unit begins with a survey of the history of evolutionary thought, and the so-called 'new synthesis'; the melding of Darwinian evolution, systematics and genetics. The Unit will provide training in the principles, methods, and applications of evolutionary biology including systems of classification, the genetics of speciation and hybrid zones, molecular evolution, reconstruction of phylogenies, population genetics, historical interpretation of geographic distributions, evolution of sex, adaptation, human evolution, and selfish gene theory. Examples from a broad range of organisms and data sources will be used throughout the Unit. This Unit is valuable for students who intend to seek employment in areas such as biodiversity research, bioinformatics, ecology, taxonomy, biological conservation and teaching.

Textbooks

Freeman and Herron (2011) Evolutionary Analysis, Pearson/Prentice Hall

BCHM3092
Proteomics and Functional Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Stuart Cordwell, Jill Johnston **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and one 3-hour practical per week. **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3992 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will focus on the high throughput methods for the analysis of gene structure and function (genomics) and the analysis of proteins (proteomics), which are at the forefront of discovery in the biomedical sciences. The course will concentrate on the hierarchy of gene-protein-structure-function through an examination of modern technologies built on the concepts of genomics versus molecular biology, and proteomics versus biochemistry. Technologies to be examined include DNA sequencing, nucleic acid and protein microarrays, two-dimensional gel electrophoresis of proteins, uses of mass spectrometry for high throughput protein identification, isotope tagging for quantitative proteomics, high-performance liquid chromatography, high-throughput functional assays, affinity chromatography and modern methods for database analysis. Particular emphasis will be placed on how these technologies can provide insight into the molecular basis of changes in cellular function under both physiological and pathological conditions as well as how they can be applied to biotechnology for the discovery of biomarkers, diagnostics, and therapeutics. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in proteomics and genomics.

BCHM3992
Proteomics and Functional Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Stuart Cordwell, Jill Johnston **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and one 3-hour practical per fortnight. **Prerequisites:** [An average mark of 75 or above in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or DATA2002 or ENVX2001 or BIOL2X22 or MBLG2X71 or QBIO2001)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3092 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will focus on the high throughput methods for the analysis of gene structure and function (genomics) and the analysis of proteins (proteomics) which are at the forefront of discovery in the biomedical sciences. The course will concentrate on the hierarchy of gene-protein-structure-function through an examination of modern technologies built on the concepts of genomics versus molecular biology, and proteomics versus biochemistry. Technologies to be examined include DNA sequencing, nucleic acid and protein microarrays, two-dimensional gel electrophoresis of proteins, uses of mass spectrometry for high throughput protein identification, isotope tagging for quantitative proteomics, high-performance liquid chromatography, high-throughput functional assays, affinity chromatography and modern methods for database analysis. Particular emphasis will be placed on how these technologies can provide insight into the molecular basis of changes in cellular function under both physiological and pathological conditions as well as how they can be applied to biotechnology for the discovery of biomarkers, diagnostics, and therapeutics. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in proteomics and genomics.

The lecture component of this unit of study is the same as BCHM3092. Qualified students will attend seminars/practical classes in which more sophisticated topics in proteomics and genomics will be covered.

Bioinformatics major (B) units of study

STAT3012
Applied Linear Models

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratories per week. **Prerequisites:** (DATA2002 or STAT2X12) and (MATH1X02 or MATH1014) **Prohibitions:** STAT3002 or STAT3004 or STAT3902 or STAT3912 or STAT3904 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course will introduce the fundamental concepts of analysis of data from both observational studies and experimental designs using classical linear methods, together with concepts of collection of data and design of experiments. First we will consider linear models and regression methods with diagnostics for checking appropriateness of models. We will look briefly at robust regression methods here. Then we will consider the design and analysis of experiments considering notions of replication, randomization and ideas of factorial designs. Throughout the course we will use the R statistical package to give analyses and graphical displays.

STAT3912
Applied Linear Models (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002)] and (MATH2X61 or MATH1902 or MATH2X22) **Prohibitions:** STAT3012 or STAT3002 or STAT3902 or STAT3004 or STAT3904 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an Advanced version of STAT3012, with emphasis on the mathematical techniques underlying applied linear models together with proofs of distribution theory based on vector space methods. There will be 3 lectures per week in common with STAT3012 and some advanced material given in a separate advanced tutorial together with more advanced assessment work.

STAT3014
Applied Statistics

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** DATA2002 or STAT2X12 **Prohibitions:** STAT3914 or STAT3002 or STAT3902 or STAT3006 **Assumed knowledge:** STAT3012 or STAT3912 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has three distinct but related components: Multivariate analysis; sampling and surveys; and generalised linear models. The first component deals with multivariate data covering simple data reduction techniques like principal components analysis and core multivariate tests including Hotelling's T^2, Mahalanobis' distance and Multivariate Analysis of Variance (MANOVA). The sampling section includes sampling without replacement, stratified sampling, ratio estimation, and cluster sampling. The final section looks at the analysis of categorical data via generalized linear models. Logistic regression and log-linear models will be looked at in some detail along with special techniques for analyzing discrete data with special structure.

STAT3914
Applied Statistics Advanced

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour computer laboratory per week plus an extra hour each week which will alternate between lectures and tutorials. **Prerequisites:** STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002) **Prohibitions:** STAT3014 or STAT3907 or STAT3902 or STAT3006 or STAT3002 **Assumed knowledge:** STAT3912 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an Advanced version of STAT3014. There will be 3 lectures per week in common with STAT3014. The unit will have extra lectures focusing on multivariate distribution theory developing results for the multivariate normal, partial correlation, the Wishart distribution and Hotelling's T^2. There will also be more advanced tutorial and assessment work associated with this unit.

Bioinformatics major (C) unit of study

COMP3520
Operating Systems Internals

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** COMP2129 **Assessment:** Through semester assessment (40%) and Final Exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive discussion of relevant OS issues and principles and describe how those principles are put into practice in real operating systems. The contents include internal structure of OS; several ways each major aspect (process scheduling, inter-process communication, memory management, device management, file systems) can be implemented; the performance impact of design choices; case studies of common OS (Linux, MS Windows NT, etc.).

INFO3911
IT Special Project 3A

Credit points: 6 **Session:** Semester 1 **Classes:** Meetings, Project Work - own time **Prerequisites:** [85% average in IT units of study in previous year] AND [Permission from the School of IT] **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units

This unit enables talents students with maturing IT knowledge to integrate various IT skills and techniques to carry out projects. These projects are largely research intensive.

INFO3912
IT Special Project 3B

Credit points: 6 **Session:** Semester 2 **Classes:** Meetings, Project Work - own time **Prerequisites:** [85% average in IT units of study in previous year] AND [Permission from the School of IT] **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units

This unit enables talents students with maturing IT knowledge to integrate various IT skills and techniques to carry out projects. These projects are largely research intensive.

Bioinformatics major (D) unit of study

BINF3101
Bioinformatics Project

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 2 **Classes:** Meeting with academic supervisor 1 hour per week and class meeting 1 hour per week. **Prerequisites:** 12cp from (BIOL2XXX or MBLG2XXX or BCMB2XXX or GEGE2XXX or BCHM2XXX or MICR2XXX or PCOL2XXX or QBIO2XXX or ENVX2XXX or DATA2002 or GENE2002) **Prohibitions:** COMP3206 or BINF3001 or INFO3600 or SOFT3300 or SOFT3600 or SOFT3200 or SOFT3700 **Assumed knowledge:** INFO2110 and (INFO1103 or INFO1903) **Assessment:** Oral group presentations, individual and group reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide students an opportunity to apply the knowledge and practice the skills acquired in the prerequisite and qualifying units, in the context of designing and building a substantial bioinformatics application. Working in groups, students will carry out the full range of activities including requirements capture, analysis and design, coding, testing and documentation.

Table 1: Chemistry

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Chemistry			
For a major in Chemistry, the minimum requirement is 24 credit points from senior units of study listed in this subject area, which must include the associated laboratory units.			
Junior units of study			
CHEM1011 **Fundamentals of Chemistry 1A**	6	**A** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 *Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1
CHEM1012 **Fundamentals of Chemistry 1B**	6	**P** CHEM1XX1 **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992	Semester 2
CHEM1111 **Chemistry 1A**	6	**A** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 *Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).*	Semester 1 Semester 2 Summer Main
CHEM1112 **Chemistry 1B**	6	**P** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992	Semester 1 Semester 2
CHEM1911 **Chemistry 1A (Advanced)**	6	**A** 80 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 *Note: Department permission required for enrolment*	Semester 1
CHEM1912 **Chemistry 1B (Advanced)**	6	**P** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 *Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.*	Semester 2
CHEM1991 **Chemistry 1A (Special Studies Program)**	6	**A** 90 or above in HSC Chemistry or equivalent **N** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 *Note: Department permission required for enrolment*	Semester 1
CHEM1992 **Chemistry 1B (Special Studies Program)**	6	**P** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **N** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 *Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.*	Semester 2
Intermediate units of study			
CHEM2401 **Molecular Reactivity and Spectroscopy**	6	**A** 6cp MATH1XXX **P** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 or CHEM2915 *This is a required chemistry unit of study for students intending to major in chemistry.*	Semester 1
CHEM2911 **Molecular Reactivity and Spectroscopy Adv**	6	**A** 6cp MATH1XXX **P** (A mark of 65 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 65 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2915	Semester 1
CHEM2915 **Molecular Reactivity and Spectroscopy SSP**	6	**A** 6cp MATH1XXX **P** (A mark of 75 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 75 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 *Note: Department permission required for enrolment* *The number of places in this unit of study is strictly limited and entry is by invitation only. Enrolment is conditional upon available places.*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHEM2402 **Chemical Structure and Stability**	6	**A** 6cp MATH1XXX **P** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **N** CHEM2202 or CHEM2302 or CHEM2902 or CHEM2912 or CHEM2916 *This is a required chemistry unit of study for students intending to major in chemistry.*	Semester 2
CHEM2912 **Chemical Structure and Stability (Adv)**	6	**A** 6cp MATH1XXX **P** (A mark of 65 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 65 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **N** CHEM2202 or CHEM2302 or CHEM2402 or CHEM2902 or CHEM2916	Semester 2
CHEM2916 **Chemical Structure and Stability (SSP)**	6	**A** 6cp MATH1XXX **P** (A mark of 75 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 75 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **N** CHEM2202 or CHEM2302 or CHEM2402 or CHEM2902 or CHEM2912 *Note: Department permission required for enrolment* *The number of places in this unit of study is strictly limited and entry is by invitation only. Enrolment is conditional upon available places.*	Semester 2
CHEM2404 **Forensic and Environmental Chemistry**	6	**A** 6cp MATH1XXX **P** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **N** AGCH3033 *To enrol in Senior Chemistry students are required to have completed (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916).*	Semester 1
CHEM2403 **Chemistry of Biological Molecules**	6	**A** 6cp MATH1XXX **P** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **N** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2913 *To enrol in Senior Chemistry, students are required to have completed (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916).*	Semester 2
Senior units of study			
CHEM3110 **Biomolecules: Properties and Reactions**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3910	Semester 1
CHEM3910 **Biomolecules: Properties and Reactions Adv**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3110	Semester 1
CHEM3111 **Organic Structure and Reactivity**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3911	Semester 1
CHEM3911 **Organic Structure and Reactivity (Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3111	Semester 1
CHEM3112 **Materials Chemistry**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3912	Semester 1
CHEM3912 **Materials Chemistry (Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3112	Semester 1
CHEM3113 **Catalysis and Sustainable Processes**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3913	Semester 1
CHEM3913 **Catalysis and Sustainable Process (Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3113	Semester 1
CHEM3114 **Metal Complexes: Medicine and Materials**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916). **N** CHEM3914	Semester 2
CHEM3914 **Metal Complexes: Medic. and Mater. (Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3114	Semester 2
CHEM3115 **Synthetic Medicinal Chemistry**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3915	Semester 2
CHEM3915 **Synthetic Medicinal Chemistry (Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3115	Semester 2
CHEM3116 **Membranes, Self Assembly and Surfaces**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3916	Semester 2
CHEM3916 **Membranes, Self Assembly and Surfaces(Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3116	Semester 2
CHEM3117 **Molecular Spectroscopy and Quantum Theory**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3917	Semester 2
CHEM3917 **Mol. Spectroscopy and Quantum Theory (Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3117	Semester 2

Chemistry

For a major in Chemistry, the minimum requirement is 24 credit points from senior units of study listed in this subject area, which must include the associated laboratory units.

Junior units of study

CHEM1011
Fundamentals of Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1111 or CHEM1911 or CHEM1991 **Assumed knowledge:** There is no assumed knowledge of chemistry for this unit of study but students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February). **Assessment:** quizzes, attendance, laboratory log book, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed HSC Chemistry (or equivalent) are strongly advised to take the Chemistry Bridging Course (offered in February, and online year-round, see http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will equip you with the fundamental knowledge and skills in chemistry for broad application. You will learn about atomic theory, structure and bonding, equilibrium, processes occurring in solutions, and the functional groups of molecules. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students whose chemical background is weak (or non-existent). Compared to the mainstream Chemistry 1A, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit and Fundamentals of Chemistry 1B requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1012
Fundamentals of Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1XX1 **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1112 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Fundamentals of Chemistry 1B is built on a satisfactory prior knowledge of Fundamentals of Chemistry 1A. Compared to the mainstream Chemistry 1B, the theory component of this unit begins with more fundamental concepts, and does not cover, or goes into less detail about some topics. Progression to intermediate chemistry from this unit requires completion of an online supplementary course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1111
Chemistry 1A

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2, Summer Main **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1911 or CHEM1991 **Assumed knowledge:** Students who have not completed HSC Chemistry (or equivalent) and HSC Mathematics (or equivalent) are strongly advised to take the Chemistry and Mathematics Bridging Courses (offered in February) **Assessment:** quizzes, attendance, laboratory log book, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have not completed secondary school chemistry are strongly advised to instead complete Fundamentals of Chemistry 1A in the first semester of the calendar year (unless you require 12 credit points of Chemistry and are commencing in semester 2). You should also take the Chemistry Bridging Course in advance (offered in February, and online year-round http://sydney.edu.au/science/chemistry/studying-chemistry/bridging-course.shtml).

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do dyes work, how do we desalinate water, how do we measure the acid content in foods, how do we get the blue in a blueprint, and how do we extract natural products from plants? Through inquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. This unit of study is directed toward students with a satisfactory prior knowledge of the HSC chemistry course.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1112
Chemistry 1B

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1, Semester 2 **Classes:** 1x3-hr lecture; 1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1111 or CHEM1911 or CHEM1101 or CHEM1901 or (75 or above in CHEM1011 or CHEM1001) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1912 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviours, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions like how do we develop lotions that don't burn us, how do we measure UV absorption by sunscreens, how can we measure and alter soil pH, how are sticky things made, and how do we determine the concentration of vitamin C in juice? Through enquiry, observation and measurement, you will understand the 'why' and the 'how' of the natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B is built on a satisfactory prior knowledge of Chemistry 1A.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1911
Chemistry 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1991 **Assumed knowledge:** 80 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, laboratory log book, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups of molecules.You will develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through inquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions.This unit of study is directed toward students with a good secondary performance both overall and in chemistry or science. Students in this category are expected to do this unit rather than Chemistry 1A. Compared to the mainstream Chemistry 1A, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1912
Chemistry 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures and 1x1-hr tutorial per week; 1x3-hr practical per week for 9 weeks **Prerequisites:** CHEM1911 or CHEM1991 or CHEM1901 or CHEM1903 or (75 or above in CHEM1111 or CHEM1101) or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1992 **Assessment:** quizzes, assignments, laboratory attendance and log book, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Advanced units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how medicines work, the properties of materials and substances, how beer is brewed, and for obtaining forensic evidence.This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for broad application, including further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will further develop experimental design, conduct and analysis skills in chemistry through experiments that ask and answer questions about the chemical nature and processes occurring around you. Through enquiry, observation and measurement, you will better understand natural and physical world and will be able to apply this understanding to real-world problems and solutions. Chemistry 1B (Advanced) is built on a satisfactory prior knowledge of Chemistry 1A (Advanced). Compared to the mainstream Chemistry 1B, the theory component of this unit provides a higher level of academic rigour and makes broader connections between topics.

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1991
Chemistry 1A (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3hr practical per week for 12 weeks **Prohibitions:** CHEM1001 or CHEM1101 or CHEM1901 or CHEM1903 or CHEM1109 or CHEM1011 or CHEM1111 or CHEM1911 **Assumed knowledge:** 90 or above in HSC Chemistry or equivalent **Assessment:** quizzes, attendance, presentations, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Chemistry describes how and why things happen from a molecular perspective. Chemistry underpins all aspects of the natural and physical world, and provides the basis for new technologies and advances in the life, medical and physical sciences, engineering, and industrial processes. This unit of study will further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, and further study in chemistry. You will learn about nuclear and radiation chemistry, wave theory, atomic orbitals, spectroscopy, bonding, enthalpy and entropy, equilibrium, processes occurring in solutions, and the functional groups in carbon chemistry. You will develop experimental design, conduct and analysis skills in chemistry in small group projects.The laboratory program is designed to extend students who already have chemistry laboratory experience, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as aptitude as demonstrated by high school chemistry results. Entry to Chemistry 1A (Special Studies Program) is restricted to a small number of students with an excellent school record in Chemistry, and applications must be made to the School of Chemistry.The practical work syllabus for Chemistry 1A (Special Studies Program) is very different from that for Chemistry 1A and Chemistry 1A (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1A (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

CHEM1992
Chemistry 1B (Special Studies Program)

Credit points: 6 **Teacher/Coordinator:** Dr Toby Hudson **Session:** Semester 2 **Classes:** 3x1-hr lectures; 1x1-hr tutorial per week; 1x3-hr practical per week for 12 weeks **Prerequisites:** 75 or above in CHEM1991 or CHEM1903 or (90 or above in HSC Chemistry or equivalent) **Prohibitions:** CHEM1002 or CHEM1102 or CHEM1902 or CHEM1904 or CHEM1108 or CHEM1012 or CHEM1112 or CHEM1912 **Assessment:** quizzes, assignment, skills-based assessment, final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students who commence in semester 2 are strongly advised that you would be better served by taking the mainstream level units in sequence, Chemistry 1A before Chemistry 1B, rather than the Special Studies Program units in the opposite order.

Chemistry transforms the way we live. It provides the basis for understanding biological, geological and atmospheric processes, how food and medicines work, the properties of materials and substances. This unit of study builds upon your prior knowledge of chemistry to further develop your knowledge and skills in chemistry for application to life and medical sciences, engineering, industrial processing, and further study in chemistry. You will learn about organic chemistry reactions, structural determination, nitrogen chemistry, industrial processes, kinetics, electrochemistry, thermochemistry, phase behaviour, solubility equilibrium and chemistry of metals. You will develop experimental design, conduct and analysis skills in chemistry in small group projects. The laboratory program is designed to extend students, and particularly caters for students who already show a passion and enthusiasm for research chemistry, as well as a demonstrated aptitude. Chemistry 1B (Special Studies Program) is restricted to students who have gained a Distinction in Chemistry 1A (Special Studies Program) or by invitation. The practical work syllabus for Chemistry 1B (Special Studies Program) is very different from that for Chemistry 1B and Chemistry 1B (Advanced) and consists of special project-based laboratory exercises. All other unit of study details are the same as those for Chemistry 1B (Advanced).

Textbooks

Recommended textbook: Blackman, Bottle, Schmid, Mocerino and Wille,Chemistry, 3rd Edition, 2015 (John Wiley) ISBN: 978-0-7303-1105-8 (paperback) or 978-0-7303-2492-8 (e-text)

Intermediate units of study

CHEM2401
Molecular Reactivity and Spectroscopy

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 1 **Classes:** Three 1-hour lectures per week, seven 1-hour tutorials per semester, eight 4-hour practicals per semester **Prerequisites:** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **Prohibitions:** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 or CHEM2915 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a required chemistry unit of study for students intending to major in chemistry.

This is one of the two core units of study for students considering majoring in chemistry, and for students of other disciplines who wish to acquire a good general background in chemistry. The unit considers fundamental questions of molecular structure, chemical reactivity, and molecular spectroscopy: What are chemical reactions and what makes them happen? How can we follow and understand them? How can we exploit them to make useful molecules? This course includes the organic and medicinal chemistry of aromatic and carbonyl compounds, organic reaction mechanisms, molecular spectroscopy, quantum chemistry, and molecular orbital theory.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2911
Molecular Reactivity and Spectroscopy Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 1 **Classes:** Three 1-hour lectures per week, seven 1-hour tutorials per semester and eight 4-hour practicals per semester **Prerequisites:** (A mark of 65 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 65 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **Prohibitions:** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2915 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The syllabus for this unit is the same as that of CHEM2401 together with special Advanced material presented in the practical program. The lectures cover fundamental consideration of molecular electronic structure and its role in molecular reactivity and spectroscopy and include applications of spectroscopy, the organic chemistry of aromatic systems, molecular orbital theory and quantum chemistry. For more details of the lecture syllabus, please read the entry for CHEM2401.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2915
Molecular Reactivity and Spectroscopy SSP

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 1 **Classes:** Three 1-hour lectures per week, twelve 1-hour SSP seminars per semester, eight 4-hour practicals per semester **Prerequisites:** (A mark of 75 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 75 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **Prohibitions:** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2312 or CHEM2401 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2911 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, assignments, lab reports and final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: The number of places in this unit of study is strictly limited and entry is by invitation only. Enrolment is conditional upon available places.

The lectures for this unit comprise the lectures for CHEM2401 and the Advanced practical program together with additional SSP seminars.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2402
Chemical Structure and Stability

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 2 **Classes:** Three 1-hour lectures per week, seven 1-hour tutorials per semester, eight 4-hour practicals per semester **Prerequisites:** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **Prohibitions:** CHEM2202 or CHEM2302 or CHEM2902 or CHEM2912 or CHEM2916 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a required chemistry unit of study for students intending to major in chemistry.

This is the second core unit of study for students considering majoring in chemistry, and for students seeking a good general background in chemistry. The unit continues the consideration of molecular structure and chemical reactivity. Topics include the structure and bonding of inorganic compounds, the properties of metal complexes, materials chemistry and nanotechnology, thermodynamics and kinetics.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2912
Chemical Structure and Stability (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 2 **Classes:** Three 1-hour lectures per week, seven 1-hour tutorials per semester, eight 4-hour practicals per semester **Prerequisites:** (A mark of 65 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 65 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **Prohibitions:** CHEM2202 or CHEM2302 or CHEM2402 or CHEM2902 or CHEM2916 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The syllabus for this unit is the same as that of CHEM2402 together with special Advanced material presented in the practical program. The lectures include the properties of inorganic compounds and complexes, statistical thermodynamics, the chemistry of carbonyls, nucleophilic organometallic reagents, and synthetic methods. For more details of the lecture syllabus, please read the entry for CHEM2402.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2916
Chemical Structure and Stability (SSP)

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 2 **Classes:** Three 1-hour lectures per week, twelve 1-hour SSP seminars per semester, eight 4-hour practicals per semester **Prerequisites:** (A mark of 75 or above in CHEM1111 or CHEM1101 or CHEM1911 or CHEM1901 or CHEM1991 or CHEM1903) and (a mark of 75 or above in CHEM1112 or CHEM1102 or CHEM1912 or CHEM1902 or CHEM1992 or CHEM1904) **Prohibitions:** CHEM2202 or CHEM2302 or CHEM2402 or

CHEM2902 or CHEM2912 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, assignments, lab reports and final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: The number of places in this unit of study is strictly limited and entry is by invitation only. Enrolment is conditional upon available places.

The lectures for this unit comprise the lectures for CHEM2402 and the Advanced practical program together with additional SSP seminars comprising three seminar series on state of the art topics in chemistry.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2404
Forensic and Environmental Chemistry

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 1 **Classes:** Three 1-hour lectures per week, six 1-hour tutorials and five 4-hour practical sessions per semester **Prerequisites:** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **Prohibitions:** AGCH3033 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: To enrol in Senior Chemistry students are required to have completed (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916).

The identification of chemical species and quantitative determination of how much of each species is present are the essential first steps in solving all chemical puzzles. In this course students learn analytical techniques and chemical problem solving in the context of forensic and environmental chemistry. The lectures on environmental chemistry cover atmospheric chemistry (including air pollution, global warming and ozone depletion), and water/soil chemistry (including bio-geochemical cycling, chemical speciation, catalysis and green chemistry). The forensic component of the course examines the gathering and analysis of evidence, using a variety of chemical techniques, and the development of specialised forensic techniques in the analysis of trace evidence. Students will also study forensic analyses of inorganic, organic and biological materials (dust, soil, inks, paints, documents, etc) in police, customs and insurance investigations and learn how a wide range of techniques are used to examine forensic evidence.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

CHEM2403
Chemistry of Biological Molecules

Credit points: 6 **Teacher/Coordinator:** A/Prof Siegbert Schmid **Session:** Semester 2 **Classes:** Three 1-hour lectures per week, six 1-hour tutorials per semester, five 4-hour practical sessions per semester **Prerequisites:** (CHEM1XX1 or CHEM1903) and (CHEM1XX2 or CHEM1904) **Prohibitions:** CHEM2001 or CHEM2101 or CHEM2301 or CHEM2311 or CHEM2502 or CHEM2901 or CHEM2903 or CHEM2913 **Assumed knowledge:** 6cp MATH1XXX **Assessment:** Quizzes, lab reports and final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: To enrol in Senior Chemistry, students are required to have completed (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916).

Life is chemistry, and this unit of study examines the key chemical processes that underlie all living systems. Lectures cover the chemistry of carbohydrates, lipids and DNA, the mechanisms of organic and biochemical reactions that occur in biological systems, chemical analysis of biological systems, the inorganic chemistry of metalloproteins, biomineralisation, biopolymers and biocolloids, and the application of spectroscopic techniques to biological systems. The practical course includes the chemical characterisation of biopolymers, experimental investigations of iron binding proteins, organic and inorganic chemical analysis, and the characterisation of anti-inflammatory drugs.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/intermediate-chemistry.shtml

Senior units of study

CHEM3110
Biomolecules: Properties and Reactions

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures and two 4-hour practicals per week for half of semester **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3910 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

DNA, proteins and carbohydrates represent three classes of essential biomolecules present in all biological systems. This unit will cover the structure, reactivity and properties of biomolecules and the building blocks from which these molecules are assembled. Interactions between biomolecules and metalions, small molecules and other biomolecules will be covered and the chemical tools for studying biomolecules highlighted. The design and synthesis of small molecules which mimic the functions of biomolecules will also be illustrated.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3910
Biomolecules: Properties and Reactions Adv

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3110 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

DNA, proteins and carbohydrates represent three classes of essential biomolecules present in all biological systems. This unit will cover the structure, reactivity and properties of biomolecules and the building blocks from which these molecules are assembled. Interactions between biomolecules and metal ions, small molecules and other biomolecules will be covered and the chemical tools for studying biomolecules highlighted. The design and synthesis of small molecules which mimic the functions of biomolecules will also be illustrated. CHEM3910 students attend the same lectures as CHEM3110 students but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3111
Organic Structure and Reactivity

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures and two 4-hour practicals per week for half of semester **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3911 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The structure and shape of organic molecules determines their physical properties, their reaction chemistry as well as their biological/medicinal activity. The determination of this structure and understanding its chemical consequences is of fundamental importance in chemistry, biochemistry, medicinal and materials chemistry. This course examines the methods and techniques used to establish the structure of organic molecules as well as the chemistry which dictates the shapes that they adopt. The first part of the course examines the use of modern spectroscopic methods (nuclear magnetic resonance spectroscopy, infrared spectroscopy and mass spectroscopy) which are used routinely to identify organic compounds. The second part of the course examines the chemical consequences of molecular shapes in more depth and looks at the inter-relationship between molecular shape and the processes by which bonds are made and broken (the reaction mechanism). An understanding of these processes allows the outcome of reactions to be predicted, which is an essential tool enabling the construction of complex molecules from simple starting materials.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3911
Organic Structure and Reactivity (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3111 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The structure and shape of organic molecules determines their physical properties, their reaction chemistry as well as their biological/medicinal activity. The determination of this structure and understanding its chemical consequences is of fundamental importance in chemistry, biochemistry, medicinal and materials chemistry. This course examines the methods and techniques used to establish the structure of organic molecules as well as the chemistry which dictates the shapes that they adopt. The first part of the course examines the use of modern spectroscopic methods (nuclear magnetic resonance spectroscopy, infrared spectroscopy and mass spectroscopy) which are used routinely to identify organic compounds. The second part of the course examines the chemical consequences of molecular shapes in more depth and looks at the inter-relationship between molecular shape and the processes by which bonds are made and broken (the reaction mechanism). An understanding of these processes allows the outcome of reactions to be predicted, which is an essential tool enabling the construction of complex molecules from simple starting materials. CHEM3911 students attend the same lectures as CHEM3111 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3112
Materials Chemistry

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures per week and two 4-hour practicals per week for half of semester. **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3912 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course concerns the inorganic chemistry of solid-state materials: compounds that possess 'infinite' bonding networks. The extended structure of solid materials gives rise to a wide range of important chemical, mechanical, electrical, magnetic and optical properties. Consequently such materials are of enormous technological significance as well as fundamental curiosity. In this course you will learn how chemistry can be used to design and synthesise novel materials with desirable properties. The course will start with familiar molecules such as C60 and examine their solid states to understand how the nature of chemical bonding changes in the solid state, leading to new properties such as electronic conduction. This will be the basis for a broader examination of how chemistry is related to structure, and how structure is related to properties such as catalytic activity, mechanical strength, magnetism, and superconductivity. The symmetry of solids will be used explain how their structures are classified, how they can transform between related structures when external conditions such as temperature, pressure and electric field are changed, and how this can be exploited in technological applications such as sensors and switches. Key techniques used to characterise solid-state materials will be covered, particularly X-ray diffraction, microscopy, and physical property measurements.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3912
Materials Chemistry (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3112 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course concerns the inorganic chemistry of solid-state materials: compounds that possess 'infinite' bonding networks. The extended structure of solid materials gives rise to a wide range of important chemical, mechanical, electrical, magnetic and optical properties. Consequently, such materials are of enormous technological significance as well as fundamental curiosity. In this course you will learn how chemistry can be used to design and synthesize novel materials with desirable properties. The course will start with familiar molecules such as C60 and examine their solid states to understand how the nature of chemical bonding changes in the solid state, leading to new properties such as electronic conduction. This will be the basis for a broader examination of how chemistry is related to structure, and how structure is related to properties such as catalytic activity, mechanical strength, magnetism, and superconductivity. The symmetry of solids will be used explain how their structures are classified, how they can transform between related structures when external conditions such as temperature, pressure and electric field are changed, and how this can be exploited in technological applications such as sensors and switches. Key techniques used to characterise solid-state materials will be covered, particularly X-ray diffraction, microscopy, and physical property measurements. CHEM3912 students attend the same lectures as CHEM3112 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3113
Catalysis and Sustainable Processes

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures per week and two 4-hour practicals per week for half of semester. **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3913 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

At present rates of consumption, the resources of 5 planets would be needed for everyone on earth to enjoy our standard of living. Since so much of our consumption and waste involves chemical processes in some way, more efficient chemical processes are needed in a sustainable tomorrow. Catalysis is and will increasingly be at the heart of these sustainable processes. This unit examines the fundamentals of catalysis and its use to design sustainable processes. The course will initially focus on the organometallic fundamentals in order to show how they can be used to understand and design homogeneous catalytic processes from a molecular perspective, which, in turn, leads on to biocatalytic conversions where the enzyme is treated like a large ligand with a special surface, pointing towards the surface chemistry involved in supported catalysts - the next topic. Within this general discussion, the special case of the three-dimensional surface found in zeotypes will be developed and the acid/base and redox catalysis (the mainstay of the majority of industrial processes) in such confined spaces of molecular dimensions will be examined. The course will continue with examining the production of polymers as an example of a major industrial process. An introduction on polymer chemistry and polymer properties will be given, followed by the examination of the various synthetic routes and processes that yield to the production of polymers. The recent advances in polymer synthesis and the design of new materials of improved properties and function will be reviewed. The last part of this section will explore the various approaches designed to improve the sustainability of polymer synthesis, in particular for the specific case of free radical polymerization, with an emphasis on the design of novel catalysts. The course will conclude by examining a variety of case studies. All the preceding topics find their way into the discussion of the key role of catalysts in the design of sustainable chemical processes, rationalizing the choices behind catalyst design.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3913
Catalysis and Sustainable Process (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3113 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

At present rates of consumption, the resources of 5 planets would be needed for everyone on earth to enjoy our standard of living. Since so much of our consumption and waste involves chemical processes in some way, more efficient chemical processes are needed in a sustainable tomorrow. Catalysis is and will increasingly be at the heart of these sustainable processes. This unit examines the fundamentals of catalysis and its use to design sustainable processes. The course will initially focus on the organometallic fundamentals in order to show how they can be used to understand and design homogeneous catalytic processes from a molecular perspective, which, in turn, leads on to biocatalytic conversions where the enzyme is treated like a large ligand with a special surface, pointing towards the surface chemistry involved in supported catalysts - the next topic. Within this general discussion, the special case of the three-dimensional surface found in zeotypes will be developed and the acid/base and redox catalysis (the mainstay of the majority of industrial processes) in such confined spaces of molecular dimensions will be examined. The course will continue with examining the production of polymers as an example of a major industrial process. An introduction on polymer chemistry and polymer properties will be given, followed by the examination of the various synthetic routes and processes that yield to the production of polymers. The recent advances in polymer synthesis and the design of new materials of improved properties and function will be reviewed. The last part of this section will explore the various approaches designed to improve the sustainability of polymer synthesis, in particular for the specific case of free radical polymerization, with an emphasis on the design of novel catalysts. The course will conclude by examining a variety of case studies. All the preceding topics find their way into the discussion of the key role of catalysts in the design of sustainable chemical processes, rationalizing the choices behind catalyst design. CHEM3913 students attend the same lectures as CHEM3113 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3114
Metal Complexes: Medicine and Materials

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and two 4-hour practicals per week for half of semester. **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916). **Prohibitions:** CHEM3914 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Coordination compounds, with bonds between a central metal atom and surrounding ligands, play critical roles in biology, biochemistry and medicine, controlling the structure and function of many enzymes and their metabolism. They play similarly vital roles in many industrial processes and in the development of new materials with specifically designed properties. Building on the foundation of crystal field theory, this course offers a comprehensive treatment of the structures and properties of coordination compounds, with a qualitative molecular orbital description of metal-ligand bonds, and their spectroscopic, magnetic and dynamic effects. The exploitation of these properties in medicine and materials will be emphasized. Medical topics include descriptions of the essential and toxic elements of the Periodic Table, metal complexes as anti-bacterial, anti-inflammatory and anti-cancer drugs, and their use as tumour imaging and radiotherapeutic agents. Materials topics include metal directed self assembly into unique structures, ligand design and control of the synthesis of nanoporous materials with new electronic and magnetic properties and applications in catalysis and molecular separations.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3914
Metal Complexes: Medic. and Mater. (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3114 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Coordination compounds, with bonds between a central metal atom and surrounding ligands, play critical roles in biology, biochemistry and medicine, controlling the structure and function of many enzymes and their metabolism. They play similarly vital roles in many industrial processes and in the development of new materials with specifically designed properties. Building on the foundation of crystal field theory, this course offers a comprehensive treatment of the structures and properties of coordination compounds, with a qualitative molecular orbital description of metal-ligand bonds, and their spectroscopic, magnetic and dynamic effects. The exploitation of these properties in medicine and materials will be emphasized. Medical topics include descriptions of the essential and toxic elements of the Periodic Table, metal complexes as anti-bacterial, anti-inflammatory and anti-cancer drugs, and their use as tumour imaging and radiotherapeutic agents. Materials topics include metal directed self assembly into unique structures, ligand design and control of the synthesis of nanoporous materials with new electronic and magnetic properties and applications in catalysis and molecular separations. CHEM3914 students attend the same lectures as CHEM3114 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3115
Synthetic Medicinal Chemistry

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and two 4-hour practicals per week for half of semester. **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3915 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The development of new pharmaceuticals fundamentally relies on the ability to design and synthesize new compounds. Synthesis is an enabling discipline for medicinal chemistry - without it, the development of new drugs cannot progress from design to implementation, and ultimately to a cure. This unit will tackle important factors in drug design, and will highlight the current arsenal of methods used in the discovery of new drugs, including rational drug design, high throughput screening and combinatorial chemistry. We will develop a logical approach to planning a synthesis of a particular target structure. The synthesis and chemistry of heterocycles, which comprise some 40% of all known organic compounds and are particularly common in pharmaceuticals, will be outlined. Examples will include important ring systems present in biological systems, such as pyrimidines and purines (DNA and RNA), imidazole and thiazole (amino acids and vitamins) and porphyrins (natural colouring substances and oxygen carrying component of blood). Throughout the course, the utility of synthesis in medicinal chemistry will be illustrated with case studies such as anti-influenza (Relenza), anaesthetic (benzocaine), anti-inflammatory (Vioxx), antihypertensive (pinacidil) and cholesterol-lowering (Lovastatin) drugs.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3915
Synthetic Medicinal Chemistry (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3115 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The development of new pharmaceuticals fundamentally relies on the ability to design and synthesize new compounds. Synthesis is an enabling discipline for medicinal chemistry - without it, the development of new drugs cannot progress from design to implementation, and ultimately to a cure. This unit will tackle important factors in drug design, and will highlight the current arsenal of methods used in the discovery of new drugs, including rational drug design, high throughput screening and combinatorial chemistry. We will develop a logical approach to planning a synthesis of a particular target structure. The synthesis and chemistry of heterocycles, which comprise some 40% of all known organic compounds and are particularly common in pharmaceuticals, will be outlined. Examples will include important ring systems present in biological systems, such as pyrimidines and purines (DNA and RNA), imidazole and thiazole (amino acids and vitamins) and porphyrins (natural colouring substances and oxygen carrying component of blood). Throughout the course, the utility of synthesis in medicinal chemistry will be illustrated with case studies such as anti-influenza (Relenza), anaesthetic (benzocaine), anti-inflammatory (Vioxx), antihypertensive (pinacidil) and cholesterol-lowering (Lovastatin) drugs. CHEM3915 students attend the same lectures as CHEM3115 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3116
Membranes, Self Assembly and Surfaces

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and two 4-hour practicals per week for half of semester. **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3916 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Away from the covalent and ionic interactions that hold molecules and solids together is the world of fragile objects - folded polymers, membranes, surface adsorption and stable molecular aggregates - held together by weak forces such as van der Waals and the hydrophobic effect. The use of molecules rather than atoms as building blocks means that there are an enormous number of possibilities for stable aggregates with interesting chemical, physical and biological properties, many of which still wait to be explored. In this course we will examine the molecular interactions that drive self assembly and the consequences of these interactions in supramolecular assembly, lipid membrane formations and properties, microemulsions, polymer conformation and dynamics and range of fundamental surface properties including adhesion, wetting and colloidal stability.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3916
Membranes, Self Assembly and Surfaces(Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3116 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Away from the covalent and ionic interactions that hold molecules and solids together is the world of fragile objects - folded polymers, membranes, surface adsorption and stable molecular aggregates - held together by weak forces such as van der Waals and the hydrophobic effect. The use of molecules rather than atoms as building blocks means that there are an enormous number of possibilities for stable aggregates with interesting chemical, physical and biological properties, many of which still wait to be explored. In this course we examine the molecular interactions that drive self assembly and the consequences of these interactions in supramolecular assembly, lipid membrane formations and properties, microemulsions, polymer conformation and dynamics and range of fundamental surface properties including adhesion, wetting and colloidal stability. CHEM3916 students attend the same lectures as CHEM3916 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3117
Molecular Spectroscopy and Quantum Theory

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and two 4-hour practicals per week for half of semester. **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3917 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course will cover the fundamentals of molecular spectroscopy as a modern research tool and as a theoretical basis with which to understand everyday phenomena. This course is aimed at the student wishing a rigorous understanding of the fabric of nature -- electronic structure -- and the interaction between light and matter. The course teaches the quantum theory needed to understand spectroscopic phenomena (such as the absorption of light) at the empirical and deeper levels. A student completing this course will take with him/her an understanding of spectroscopy as both a phenomenon and a research tool. The course teaches application and theory, with descriptions of applied spectroscopic techniques. Alongside the coverage of modern spectroscopy, the course provides an accessible treatment of the science behind vision, flames, solar cells and photochemical smog.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3917
Mol. Spectroscopy and Quantum Theory (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3117 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course will cover the fundamentals of molecular spectroscopy as a modern research tool and as a theoretical basis with which to understand everyday phenomena. This course is aimed at the student wishing a rigorous understanding of the fabric of nature -- electronic structure -- and the interaction between light and matter. The course teaches the quantum theory needed to understand spectroscopic phenomena (such as the absorption of light) at the empirical and deeper levels. A student completing this course will take with him/her an understanding of spectroscopy as both a phenomenon and a research tool. The course teaches application and theory, with descriptions of applied spectroscopic techniques. Alongside the coverage of modern spectroscopy, the course provides an accessible treatment of the science behind vision, flames, solar cells and photochemical smog. CHEM3917 students attend the same lectures as CHEM3117 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

Table 1: Computer Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Computer Science			
For a major in Computer Science the minimum requirement is 24 credit points chosen from the senior units of study listed for this subject area.			
Junior units of study			
ELEC1601 **Introduction to Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
INFO1110 **Introduction to Programming**	6		Intensive July Semester 1 Semester 2
INFO1113 **Object-Oriented Programming**	6	**P** INFO1110 **N** INFO1103 OR INFO1105 OR INFO1905	Semester 1 Semester 2
DATA1002 **Informatics: Data and Computation**	6	**N** INFO1903	Semester 2
INFO1911 **IT Special Project 1A**	6	*Note: Department permission required for enrolment*	Semester 1
INFO1912 **IT Special Project 1B**	6	*Note: Department permission required for enrolment*	Semester 2
Intermediate units of study			
COMP2017 **Systems Programming**	6	**P** INFO1113 OR INFO1105 OR INFO1905 OR INFO1103 **C** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **N** COMP2129	Semester 1
COMP2022 **Programming Languages, Logic and Models**	6	**A** MATH1004 OR MATH1904 OR MATH1064 OR MATH2069 OR MATH2969 **P** INFO1103 OR INFO1903 OR INFO1113 **N** COMP2922	Semester 2
COMP2123 **Data Structures and Algorithms**	6	**P** INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **N** INFO1105 OR INFO1905 OR COMP2823	Semester 1
ISYS2110 **Analysis and Design of Web Info Systems**	6	**P** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 **N** INFO2110	Semester 1
INFO2120 **Database Systems 1** *This unit of study is not available in 2018*	6	**P** INFO1003 OR INFO1103 OR INFO1903 OR INFS1000 OR DECO1012. **N** INFO2905, COMP5138, INFO2820	Semester 1
INFO2820 **Database Systems 1 (Advanced)** *This unit of study is not available in 2018*	6	**P** Distinction-level result in INFO1003 or INFO1103 or INFO1903 or INFO1105 or INFO1905 or DECO1012. **N** INFO2905, COMP5138, INFO2120	Semester 1
ISYS2120 **Data and Information Management**	6	**A** Programming skills **P** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 OR INFO1003 OR INFO1903 OR DECO1012 **N** INFO2120 OR INFO2820 OR COMP5138	Semester 2
ISYS2160 **Information Systems in the Internet Age**	6	**A** INFO1003 OR INFO1103 OR INFO1903 OR INFO1113 **N** ISYS2140	Semester 2
INFO2150 **Introduction to Health Data Science**	6	**A** Basic knowledge of Entity Relationship Modelling, database technology and SQL **P** (INFO1003 OR INFO1903 OR INFO1103 OR INFO1110 OR DATA1002) AND (DATA1001 OR MATH1005 OR MATH1905 OR MATH1015) **C** DATA2001 or ISYS2120 OR INFO2120 OR INFO2820 OR INFO1903	Semester 2
INFO2222 **Computing 2 Usability and Security**	6	**P** 12CP 1000-level INFO	Semester 1
INFO2911 **IT Special Project 2A**	6	**P** [85% average in IT units of study in previous year] AND [Permission from the School of IT] *Note: Department permission required for enrolment*	Semester 1
INFO2912 **IT Special Project 2B**	6	**P** [85% average in IT units of study in previous year] AND [Permission from the School of IT] *Note: Department permission required for enrolment*	Semester 2
SOFT2412 **Agile Software Development Practices**	6	**P** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905	Semester 2
Senior units of study			
COMP3027 **Algorithm Design**	6	**A** MATH1004 OR MATH1904 OR MATH1064 **P** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **N** COMP2007 OR COMP2907 OR COMP3927	Semester 1
COMP3927 **Algorithm Design (Adv)**	6	**A** MATH1004 OR MATH1904 OR MATH1064 **P** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **N** COMP2007 OR COMP2907 OR COMP3027 *Note: Department permission required for enrolment*	Semester 1
COMP3221 **Distributed Systems**	6	**P** (INFO1105 OR INFO1905) OR ((INFO1103 OR INFO1113) AND (COMP2123 OR COMP2823)) **N** COMP2121	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP3308 **Introduction to Artificial Intelligence**	6	**A** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **N** COMP3608	Semester 1
COMP3608 **Introduction to Artificial Intelligence (Adv)**	6	**A** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **P** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **N** COMP3308 *COMP3308 and COMP3608 share the same lectures, but have different tutorials and assessment (the same type but more challenging).*	Semester 1
COMP3419 **Graphics and Multimedia**	6	**A** Programming skills **P** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905	Semester 2
COMP3520 **Operating Systems Internals** *This unit of study is not available in 2018*	6	**P** COMP2129	Semester 1
COMP3615 **Computer Science Project**	6	**P** (COMP2123 OR COMP2823) AND COMP2017 AND (COMP2022 OR COMP2922) **N** INFO3600 OR COMP3600 *Note: Department permission required for enrolment*	Semester 2
INFO3220 **Object Oriented Design**	6	**P** INFO2110 and COMP2129	Semester 1
INFO3315 **Human-Computer Interaction**	6		Semester 2
INFO3333 **Computing 3 Management**	6	**P** 12CP 2000-level COMP, INFO or ISYS **C** INFO2222 **N** INFO3402	Semester 1
INFO3616 **Principles of Security and Security Eng**	6	**A** INFO1110 AND INFO1112 AND INFO1113 AND MATH1064. Knowledge equivalent to the above units is assumed; this means good programming skills in Python or a C-related language, basic networking knowledge, skills from discrete mathematics. A technical orientation is expected. **N** ELEC5616	Semester 1
DATA3404 **Data Science Platforms**	6	**A** This unit of study assumes that students have previous knowledge of database structures and of SQL. The prerequisite material is covered in DATA2001 or ISYS2120. Familiarity with a programming language (e.g. Java or C) is also expected. **P** DATA2001 OR ISYS2120 OR INFO2120 OR INFO2820 **N** INFO3504 OR INFO3404	Semester 1
INFO3406 **Introduction to Data Analytics**	6	**A** Basic statistics and database management. **P** (MATH1005 OR MATH1905) AND (INFO2120 OR INFO2820).	Semester 2
INFO3600 **Major Development Project (Advanced)**	12	**P** INFO3402 **N** COMP3615 or ISYS3400 *Note: Department permission required for enrolment* *Only available to students in BIT, BCST(Adv) or BSc(Adv).*	Semester 2
INFO3911 **IT Special Project 3A**	6	**P** [85% average in IT units of study in previous year] AND [Permission from the School of IT] *Note: Department permission required for enrolment* *Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units*	Semester 1
INFO3912 **IT Special Project 3B**	6	**P** [85% average in IT units of study in previous year] AND [Permission from the School of IT] *Note: Department permission required for enrolment* *Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units*	Semester 2
ELEC3506 **Data Communications and the Internet**	6	**N** NETS2150	Semester 2
ELEC3609 **Internet Software Platforms**	6	**P** (INFO1103 OR INFO1110) AND (INFO2110 OR ISYS2110) AND (INFO2120 OR INFO2820 OR ISYS2120) **N** EBUS4001	Semester 2
ELEC3610 **E-Business Analysis and Design**	6	**N** EBUS3003	Semester 1
SOFT3413 **Software Development Project**	6	**A** SOFT3202 **P** 18CP 2000-level or above units from SOFT, COMP or INFO	Semester 2

Students should note that applications for Special Consideration on the basis of illness, injury or misadventure for INFO, ISYS, COMP, ELEC units of study should be lodged with the Faculty of Engineering and IT.

Computer Science

For a major in Computer Science the minimum requirement is 24 credit points chosen from the senior units of study listed for this subject area.

Junior units of study

ELEC1601
Introduction to Computer Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories, Tutorials **Assumed knowledge:** HSC Mathematics extension 1 or 2 **Assessment:** Through semester assessment (60%) and Final Exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces the fundamental digital concepts upon which the design and operation of modern digital computers are based. A prime aim of the unit is to develop a professional view of, and a capacity for inquiry into, the field of computing.

Topics covered include: data representation, basic computer organisation, the CPU, elementary gates and logic, machine language, assembly language and high level programming constructs.

INFO1110
Introduction to Programming

Credit points: 6 **Session:** Intensive July, Semester 1, Semester 2 **Classes:** lectures, laboratories, seminars **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an essential starting point for software developers, IT consultants, and computer scientists to build their understanding of principle computer operation. Students will obtain knowledge and skills with procedural programming. Crucial concepts include defining data types, control flow, iteration, functions, recursion, the model of addressable memory. Students will be able to reinterpret a general problem into a computer problem, and use their understanding of the computer model to develop source code. This unit trains students with software development process, including skills of testing and debugging. It is a prerequisite for more advanced programming languages, systems programming, computer security and high performance computing.

INFO1113
Object-Oriented Programming

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** lectures, laboratories, seminars **Prerequisites:** INFO1110 **Prohibitions:** INFO1103 OR INFO1105 OR INFO1905 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Object-oriented (OO) programming is a technique that arranges code into classes, each encapsulating in one place related data and the operations on that data. Inheritance is used to reuse code from a more general class, in specialised situations. Most modern programming languages provide OO features. Understanding and using these are an essential skill to software developers in industry. This unit provides the student with the concepts and individual programming skills in OO programming, starting from their previous mastery of procedural programming.

DATA1002
Informatics: Data and Computation

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories, Project Work - own time **Prohibitions:** INFO1903 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers computation and data handling, integrating sophisticated use of existing productivity software, e.g. spreadsheets, with the development of custom software using the general-purpose Python language. It will focus on skills directly applicable to data-driven decision-making. Students will see examples from many domains, and be able to write code to automate the common processes of data science, such as data ingestion, format conversion, cleaning, summarization, creation and application of a predictive model.

INFO1911
IT Special Project 1A

Credit points: 6 **Session:** Semester 1 **Classes:** Meetings, Project Work - own time **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This is a unit of study for the junior student who is an academic high achiever as well as talented in IT areas. Students will be involved in advance projects (which may be research-oriented). They need to apply their problem solving and IT skills in the project. As a result, their horizon in computer science and information system is broadened.

INFO1912
IT Special Project 1B

Credit points: 6 **Session:** Semester 2 **Classes:** Meetings, Project Work - own time **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This is a unit of study for the junior student who is an academic high achiever and is talented in IT areas. Students will involve in advance projects which have research components, so that they can further demonstrate their IT and problem solving capabilities.

Intermediate units of study

COMP2017
Systems Programming

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, laboratories **Prerequisites:** INFO1113 OR INFO1105 OR INFO1905 OR INFO1103 **Corequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Prohibitions:** COMP2129 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this unit of study, elementary methods for developing robust, efficient, and re-usable software will be covered. The unit is taught in C, in a Unix environment. Specific coding topics include memory management, the pragmatic aspects of implementing data structures such as lists and hash tables and managing concurrent threads. Debugging tools and techniques are discussed and common programming errors are considered along with defensive programming techniques to avoid such errors. Emphasis is placed on using common Unix tools to manage aspects of the software construction process, such as version control and regression testing. The subject is taught from a practical viewpoint and it includes a considerable amount of programming practice.

COMP2022
Programming Languages, Logic and Models

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials **Prerequisites:** INFO1103 OR INFO1903 OR INFO1113 **Prohibitions:** COMP2922 **Assumed knowledge:** MATH1004 OR MATH1904 OR MATH1064 OR MATH2069 OR MATH2969 **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to the foundations of computational models, and their connection to programming languages/tools. The unit covers various abstract models for computation including Lambda Calculus, and Logic calculi (e. g. concept of formal proofs in propositional, predicate, and temporal logic). For each abstract model, we introduce programming languages/tools that are built on the introduced abstract computational models. We will discuss functional languages including Scheme/Haskell, and Prolog/Datalog.

COMP2123
Data Structures and Algorithms

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **Prohibitions:** INFO1105 OR INFO1905 OR COMP2823 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will teach some powerful ideas that are central to solving algorithmic problems in ways that are more efficient than naive approaches. In particular, students will learn how data collections can support efficient access, for example, how a dictionary or map can allow key-based lookup that does not slow down linearly as the collection grows in size. The data structures covered in this unit include lists, stacks, queues, priority queues, search trees, hash tables, and graphs. Students will also learn efficient techniques for classic tasks such as sorting a collection. The concept of asymptotic notation will be introduced, and used to describe the costs of various data access operations and algorithms.

ISYS2110
Analysis and Design of Web Info Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, tutorials **Prerequisites:** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 **Prohibitions:** INFO2110 **Assessment:** through semester assessment (40%), final exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course discusses the processes, methods, techniques and tools that organisations use to determine how they should conduct their business, with a particular focus on how web-based technologies can most effectively contribute to the way business is organized. The course covers a systematic methodology for analysing a business problem or opportunity, determining what role, if any, web-based technologies can play in addressing the business need, articulating business requirements for the technology solution, specifying alternative approaches to acquiring the technology capabilities needed to address the business requirements, and specifying the requirements for the information systems solution in particular, in-house development, development from third-party providers, or purchased commercial-off-the-shelf (COTS) packages.

INFO2120
Database Systems 1

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** INFO1003 OR INFO1103 OR INFO1903 OR INFS1000 OR DECO1012. **Prohibitions:** INFO2905, COMP5138, INFO2820 **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The ubiquitous use of information technology leaves us facing a tsunami of data produced by users, IT systems and mobile devices. The proper management of data is hence essential for all applications and for effective decision making within organisations.

This unit of study will introduce the basic concepts of database designs at the conceptual, logical and physical levels. We will place particular emphasis on introducing integrity constraints and the concept of data normalisation which prevents data from being corrupted or duplicated in different parts of the database. This in turn helps in the data remaining consistent during its lifetime. Once a database design is in place, the emphasis shifts towards querying the data in order to extract useful information. The unit will introduce different query languages with a particular emphasis on SQL, which is industry standard. Other topics covered will include the important concept of transaction management, application development with a backend database, an overview of data warehousing and OLAP, and the use of XML as a data integration language.

INFO2820
Database Systems 1 (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** Distinction-level result in INFO1003 or INFO1103 or INFO1903 or INFO1105 or INFO1905 or DECO1012. **Prohibitions:** INFO2905, COMP5138, INFO2120 **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The ubiquitous use of information technology comes with immense amounts of data produced by users, IT systems and mobile devices. The proper management of data is essential for all applications, especially new ones that want to make intelligent use of the data, and for effective decision making within organisations.

This unit of study is an advanced alternative to INFO2120 that will introduce the basic concepts of database designs at the conceptual, logical and physical levels. Particular emphasis will be placed on introducing integrity constraints and the concept of data normalization which prevents data from being corrupted or duplicated in different parts of the database. This in turn helps in the data remaining consistent during its lifetime. Once a database design is in place, the emphasis shifts towards querying the data in order to extract useful information. The unit will introduce different query languages with a particular emphasis on SQL and, in INFO2820, querying graph and hierarchical data. Other topics covered will include recursive SQL, graphs in databases, NoSQL databases, transaction management, application development with a backend database, an overview of data warehousing and OLAP, and the use of XML as a data integration language.

ISYS2120
Data and Information Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials, Laboratories, Project Work - own time **Prerequisites:** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 OR INFO1003 OR INFO1903 OR DECO1012 **Prohibitions:** INFO2120 OR INFO2820 OR COMP5138 **Assumed knowledge:** Programming skills **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The ubiquitous use of information technology leaves us facing a tsunami of data produced by users, IT systems and mobile devices. The proper management of data is hence essential for all applications and for effective decision making within organizations.

This unit of study will introduce the basic concepts of database designs at the conceptual, logical and physical levels. We will place particular emphasis on introducing integrity constraints and the concept of data normalization which prevents data from being corrupted or duplicated in different parts of the database. This in turn helps in the data remaining consistent during its lifetime. Once a database design is in place, the emphasis shifts towards querying the data in order to extract useful information. The unit will introduce the SQL database query languages, which is industry standard. Other topics covered will include the important concept of transaction management, application development with a backend database, and an overview of data warehousing and OLAP.

ISYS2160
Information Systems in the Internet Age

Credit points: 6 **Session:** Semester 2 **Classes:** lectures, tutorials **Prohibitions:** ISYS2140 **Assumed knowledge:** INFO1003 OR INFO1103 OR INFO1903 OR INFO1113 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive conceptual and practical introduction to information systems (IS) in the Internet era. Key topics covered include: system thinking and system theory, basic concepts of information systems, internet and e-commerce, e-payment and m-commerce, online marketing and social media, information systems for competitive advantage, functional and enterprise systems, business intelligence, information systems development and acquisition, information security, ethics, and privacy

INFO2150
Introduction to Health Data Science

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials **Prerequisites:** (INFO1003 OR INFO1903 OR INFO1103 OR INFO1110 OR DATA1002) AND (DATA1001 OR MATH1005 OR MATH1905 OR MATH1015) **Corequisites:** DATA2001 or ISYS2120 OR INFO2120 OR INFO2820 OR INFO1903 **Assumed knowledge:** Basic knowledge of Entity Relationship Modelling, database technology and SQL **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Health organisations cannot function effectively without computer information systems. Clinical data are stored and distributed in different databases, different formats and different locations. It requires a lot of effort to create an integrated and clean-up version of data from multiple sources, This unit provides basic introduction to the process and knowledge to enable the analysis of health data. The unit will be of interest to students seeking the understanding of the various coding standards in health industry, data retrieval from databases, data linkage issue, cleaning and pre-processing steps, necessary statistical techniques and presentation of results.

It will be valuable to those who want to work as health-related occupations, such as health informatics analysts, healthcare administrators, medical and health services manager or research officers in hospitals, government health agencies and research organisations. Having said that, a good understanding of health data analysis is a useful asset to all students.

INFO2222
Computing 2 Usability and Security

Credit points: 6 **Session:** Semester 1 **Classes:** Meetings, Laboratories, Project Work - own time **Prerequisites:** 12CP 1000-level INFO **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an integrated treatment of two critical topics for a computing professional: human computer interaction (HCI) and security. The techniques and core ideas of HCI will be studied with a particular focus on examples and case studies related to security. This unit builds the students' awareness of the deep challenges in creating computing systems that can meet people's needs for both HCI and security. It will develop basic skills to evaluate systems for their effectiveness in meeting people's needs within the contexts of their use, building knowledge of common mistakes in systems, and approaches to avoid those mistakes.

INFO2911
IT Special Project 2A

Credit points: 6 **Session:** Semester 1 **Classes:** Meetings, Project Work - own time **Prerequisites:** [85% average in IT units of study in previous year] AND [Permission from the School of IT] **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit enables talented students to apply their IT knowledge from the junior years to do more exciting projects. Students are provided with the opportunities to get involved in projects which are research intensive.

INFO2912
IT Special Project 2B

Credit points: 6 **Session:** Semester 2 **Classes:** Meetings, Project Work - own time **Prerequisites:** [85% average in IT units of study in previous year] AND [Permission from the School of IT] **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit enables talented students to apply their IT knowledge from their junior years to do more exciting projects. Students are provided with the opportunities to get involved in projects which are research intensive.

SOFT2412
Agile Software Development Practices

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit builds students skills to follow defined processes in software development, in particular, working in small teams in an agile approach. Content covers the underlying concepts and principles of software processes, their analysis, measurement and improvement. Students will practice with a variety of professional-strength tool support for the practices that ensure quality outcomes. The unit requires students to enter already skilled in individual programming; instead this unit focuses on the complexities in a team setting.

Senior units of study

COMP3027
Algorithm Design

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Prohibitions:** COMP2007 OR COMP2907 OR COMP3927 **Assumed knowledge:** MATH1004 OR MATH1904 OR MATH1064 **Assessment:** through semester assessment (40%), final exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to the design techniques that are used to find efficient algorithmic solutions for given problems. The techniques covered included greedy, divide-and-conquer, dynamic programming, and adjusting flows in networks. Students will extend their skills in algorithm analysis. The unit also provides an introduction to the concepts of computational complexity and reductions between problems.

COMP3927
Algorithm Design (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Prohibitions:** COMP2007 OR COMP2907 OR COMP3027 **Assumed knowledge:** MATH1004 OR MATH1904 OR MATH1064 **Assessment:** through semester assessment (40%), final exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit provides an introduction to the design techniques that are used to find efficient algorithmic solutions for given problems. The techniques covered included greedy, divide-and-conquer, dynamic programming, and adjusting flows in networks. Students will extend their skills in algorithm analysis. The unit also provides an introduction to the concepts of computational complexity and reductions between problems.

COMP3221
Distributed Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** (INFO1105 OR INFO1905) OR ((INFO1103 OR INFO1113) AND (COMP2123 OR COMP2823)) **Prohibitions:** COMP2121 **Assessment:** through semester assessment (60%), final exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide broad introduction to the principles of distributed computing and distributed systems and their design; provide students the fundamental knowledge required to analyse, design distributed algorithms and implement various types of applications, like blockchains; explain the common algorithmic design principles and approaches used in the design of message passing at different scales (e.g., logical time, peer-to-peer overlay, gossip-based communication).

COMP3308
Introduction to Artificial Intelligence

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorials, Lectures **Prohibitions:** COMP3608 **Assumed knowledge:** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **Assessment:** Through semester assessment (45%) and Final Exam (55%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Artificial Intelligence (AI) is all about programming computers to perform tasks normally associated with intelligent behaviour. Classical AI programs have played games, proved theorems, discovered patterns in data, planned complex assembly sequences and so on. This unit of study will introduce representations, techniques and architectures used to build intelligent systems. It will explore selected topics such as heuristic search, game playing, machine learning, neural networks and probabilistic reasoning. Students who complete it will have an understanding of some of the fundamental methods and algorithms of AI, and an appreciation of how they can be applied to interesting problems. The unit will involve a practical component in which some simple problems are solved using AI techniques.

COMP3608
Introduction to Artificial Intelligence (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **Prohibitions:** COMP3308 **Assumed knowledge:** Algorithms. Programming skills (e.g. Java, Python, C, C++, Matlab) **Assessment:** Through semester assessment (45%) and Final Exam (55%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: COMP3308 and COMP3608 share the same lectures, but have different tutorials and assessment (the same type but more challenging).

An advanced alternative to COMP3308; covers material at an advanced and challenging level.

COMP3419
Graphics and Multimedia

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials **Prerequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Assumed knowledge:** Programming skills **Assessment:** Through semester assessment (40%) and Final Exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides a broad introduction to the field of graphics and multimedia computing to meet the diverse requirements of application areas such as entertainment, industrial design, virtual reality, intelligent media management, social media and remote sensing. It covers both the underpinning theories and the practices of computing and manipulating digital media including graphics / image, audio, animation, and video. Emphasis is placed on principles and cutting-edge techniques for multimedia data processing, content analysis, media retouching, media coding and compression.

COMP3520
Operating Systems Internals

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** COMP2129 **Assessment:** Through semester assessment (40%) and Final Exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive discussion of relevant OS issues and principles and describe how those principles are put into practice in real operating systems. The contents include internal structure of OS; several ways each major aspect (process scheduling, inter-process communication, memory management, device management, file systems) can be implemented; the performance impact of design choices; case studies of common OS (Linux, MS Windows NT, etc.).

COMP3615
Computer Science Project

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work, Site Visit, Meetings **Prerequisites:** (COMP2123 OR COMP2823) AND COMP2017 AND (COMP2022 OR COMP2922) **Prohibitions:** INFO3600 OR COMP3600 **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will provide students an opportunity to apply the knowledge and practise the skills acquired in the prerequisite and qualifying units, in the context of designing and building a substantial software development system in diverse application domains including life sciences. Working in groups for an external client combined with academic supervision, students will need to carry out the full range of activities including requirements capture, analysis and design, coding, testing and documentation. Students will use the XP methodology and make use of professional tools for the management of their project.

INFO3220
Object Oriented Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials, Project Work - own time **Prerequisites:** INFO2110 and COMP2129 **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers essential design methods and language mechanisms for successful object-oriented design and programming. C++ is used as the implementation language and a special emphasis is placed on those features of C++ that are important for solving real-world problems. Advanced software engineering features, including exceptions and name spaces are thoroughly covered.

INFO3315
Human-Computer Interaction

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a first subject in HCI, Human Computer Interaction. It is designed for students who want to be involved in one of the many roles required to create future technology. There are three main parts: the human foundations from psychology and physiology; HCI methods for design and evaluation of interfaces; leading edge directions for technologies.

This subject is highly multi-disciplinary. At the core, it is a mix of Computer Science Software Engineering combined with the design discipline, UX - User Experience. It draws on psychology, both for relevant theories and user study methods. The practical work is human-centred with project work that motivates the formal curriculum. This year the projects will be in area of health and wellness.

INFO3333
Computing 3 Management

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** 12CP 2000-level COMP, INFO or ISYS **Corequisites:** INFO2222 **Prohibitions:** INFO3402 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit teaches students vital skills for an effective professional career: preparing them to eventually be a leader, who ensures that others achieve high-quality outcomes. Building on experiences from earlier units (that covered working in a team, agile development practices, paying attention to needs and characteristics of users, and the value of data) this unit teaches students key concepts needed as a manager, or when working with managers. The focus includes managing projects, managing services, and ensuring governance.

INFO3616
Principles of Security and Security Eng

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials, research **Prohibitions:** ELEC5616 **Assumed knowledge:** INFO1110 AND INFO1112 AND INFO1113 AND MATH1064. Knowledge equivalent to the above units is assumed; this means good programming skills in Python or a C-related language, basic networking knowledge, skills from discrete mathematics. A technical orientation is expected. **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to the many facets of security in the digital and networked world, the challenges that IT systems face, and the design principles that have been developed to build secure systems and counter attacks. The unit puts the focus squarely on providing a thorough understanding of security principles and engineering for security. At the same time, we stress a hands-on approach to teach the state-of-the-art incarnations of security principles and technology, and we practice programming for security. We pay particular attention to the fact that security is much more than just technology as we discuss the fields of usability in security, operational security, and cyber-physical systems. At the end of this unit, graduates are prepared for practical demands in their later careers and know how to tackle new, yet unforeseen challenges.

This unit also serves as the initial step for a specialisation in computer and communications security.

DATA3404
Data Science Platforms

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** DATA2001 OR ISYS2120 OR INFO2120 OR INFO2820 **Prohibitions:** INFO3504 OR INFO3404 **Assumed knowledge:** This unit of study assumes that students have previous knowledge of database structures and of SQL. The prerequisite material is covered in DATA2001 or ISYS2120. Familiarity with a programming language (e.g. Java or C) is also expected. **Assessment:** through semester assessment (40%), final exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a comprehensive overview of the internal mechanisms data science platforms and of systems that manage large data collections. These skills are needed for successful performance tuning and to understand the scalability challenges faced by when processing Big Data. This unit builds upon the second' year DATA2001 - 'Data Science - Big Data and Data Diversity' and correspondingly assumes a sound understanding of SQL and data analysis tasks.

The first part of this subject focuses on mechanisms for large-scale data management. It provides a deep understanding of the internal components of a data management platform. Topics include: physical data organization and disk-based index structures, query processing and optimisation, and database tuning.

The second part focuses on the large-scale management of big data in a distributed architecture. Topics include: distributed and replicated databases, information retrieval, data stream processing, and web-scale data processing.

The unit will be of interest to students seeking an introduction to data management tuning, disk-based data structures and algorithms, and information retrieval. It will be valuable to those pursuing such careers as Software Engineers, Data Engineers, Database Administrators, and Big Data Platform specialists.

INFO3406
Introduction to Data Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories **Prerequisites:** (MATH1005 OR MATH1905) AND (INFO2120 OR INFO2820). **Assumed knowledge:** Basic statistics and database management. **Assessment:** Through semester assessment (40%) and Final Exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Big Data refers to datasets that are massive, heterogenous, and dynamic that are beyond current approaches for the capture, storage, management, and analysis of the data. The focus of this unit is on understanding and applying relevant concepts, techniques, algorithms, and tools for the analysis, management and visualization of big data - with the goal of keeping abreast of the continual increase in the volume and complexity of data sets and enabling discovery of information and knowledge to guide effective decision making.

INFO3600
Major Development Project (Advanced)

Credit points: 12 **Session:** Semester 2 **Classes:** Project Work - in class, Site Visits, Project Work - own time, Meetings **Prerequisites:** INFO3402 **Prohibitions:** COMP3615 or ISYS3400 **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Only available to students in BIT, BCST(Adv) or BSc(Adv).

This unit will provide students an opportunity to apply the knowledge and practise the skills acquired in the prerequisite and qualifying units, in the context of designing and building a substantial software development system in diverse application domains including life sciences. Working in groups for an external client combined with academic supervision, students will need to carry out the full range of activities including requirements capture, analysis and design, coding, testing and documentation. Students will use the XP methodology and make use of professional tools for the management of their project.

INFO3911
IT Special Project 3A

Credit points: 6 **Session:** Semester 1 **Classes:** Meetings, Project Work - own time **Prerequisites:** [85% average in IT units of study in previous year] AND [Permission from the School of IT] **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units

This unit enables talents students with maturing IT knowledge to integrate various IT skills and techniques to carry out projects. These projects are largely research intensive.

INFO3912
IT Special Project 3B

Credit points: 6 **Session:** Semester 2 **Classes:** Meetings, Project Work - own time **Prerequisites:** [85% average in IT units of study in previous year] AND [Permission from the School of IT] **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units

This unit enables talents students with maturing IT knowledge to integrate various IT skills and techniques to carry out projects. These projects are largely research intensive.

ELEC3506
Data Communications and the Internet

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories, Tutorials **Prohibitions:** NETS2150 **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students undertaking this unit should be familiar with fundamental digital technologies and representations such as bit complement and internal word representation. Students should also have a basic understanding of the physical properties of communication channels, techniques and limitations. Furthermore, students should be able to apply fundamental mathematical skills.

The unit will cover the following specific material: Communication reference models (TCP/IP and OSI). Circuit switched and packet switched communication. Network node functions and building blocks. LAN, MAN, WAN, WLAN technologies. Protocols fundamental mechanisms. The TCP/IP core protocols (IP, ICMP, DHCP, ARP, TCP, UDP etc.). Applications and protocols (ftP, Telnet, SMTP, HTTP etc.), Network Management and Security.

ELEC3609
Internet Software Platforms

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials, Project Work - own time **Prerequisites:** (INFO1103 OR INFO1110) AND (INFO2110 OR ISYS2110) AND (INFO2120 OR INFO2820 OR ISYS2120) **Prohibitions:** EBUS4001 **Assessment:** Through semester assessment (60%) and Final Exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on the design, the architecture and the development of web applications using technologies currently popular in the marketplace including Java and . NET environments. There are three key themes examined in the unit: Presentation layer, Persistence layer, and Interoperability. The unit will examine practical technologies such as JSP and Servlets, the model-view-controller (MVC) architecture, database programming with ADO. NET and JDBC, advanced persistence using ORM, XML for interoperability, and XML-based SOAP services and Ajax, in support of the theoretical themes identified.

On completion the students should be able to: Compare Java/J2EE web application development with Microsoft . NET web application development; Exposure to relevant developer tools (e. g. Eclipse and VS. NET); Be able to develop a real application on one of those environments; Use XML to implement simple web services and AJAX applications.

ELEC3610
E-Business Analysis and Design

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - in class, Project Work - own time, Presentation, Tutorials **Prohibitions:** EBUS3003 **Assessment:** Through semester assessment (70%) and Final Exam (30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines the essential pre-production stages of designing successful internet websites and services. It focuses on the aspects of analysis, project specification, design, and prototype that lead up to the actual build of a website or application. Topics include, B2C, B2B and B2E systems, business models, methodologies, modeling with use cases / UML and WebML, the Project Proposal and Project Specification Document, Information Architecture and User-Centred Design, legal issues, and standards-based web development. Students build a simple use-case based e-business website prototype with web standards. A final presentation of the analysis, design and prototype are presented in a role play environment where students try to win funding from a venture capitalist. An understanding of these pre-production fundamentals is critical for future IT and Software Engineering Consultants, Project Managers, Analysts and CTOs.

SOFT3413
Software Development Project

Credit points: 6 **Session:** Semester 2 **Classes:** project work, site visits, meetings **Prerequisites:** 18CP 2000-level or above units from SOFT, COMP or INFO **Assumed knowledge:** SOFT3202 **Assessment:** through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide students an opportunity to apply the knowledge and practice the skills acquired in the prerequisite and qualifying units, in the context of designing and building a substantial software development system in diverse application domains including life sciences. Working in groups for an external client combined with academic supervision, students will need to carry out the full range of activities including requirements capture, analysis and design, coding, testing and documentation. Students will use the XP methodology and make use of professional tools for the management of their project.

Table 1: Environmental Studies

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Environmental Studies			
For a major in Environmental Studies, students are required to complete a minimum of 24 credit points from Senior units of study listed below, including at least 12 credit points from Senior ENVI units			
Junior units of study			
Students are recommended to take GEOS1001/1901 and at least one of the following units of study: BIOL1006/1906/1996, BIOL1007/1907/1997, GEOS1002/1902, GEOS1003/1903			
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
GEOS1901 **Earth, Environment and Society Advanced**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 *Note: Department permission required for enrolment*	Semester 1
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
GEOS1002 **Introductory Geography**	6	**N** GEOS1902 or GEOG1001 or GEOG1002	Semester 2
GEOS1902 **Introductory Geography (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1002 or GEOG1001 or GEOG1002 *Note: Department permission required for enrolment*	Semester 2
GEOS1003 **Introduction to Geology**	6	**N** GEOS1903 or GEOL1002 or GEOL1902 or GEOL1501	Semester 2 Summer Main
GEOS1903 **Introduction to Geology (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1003 or GEOL1002 or GEOL1902 *Note: Department permission required for enrolment*	Semester 2
Intermediate units of study			
Students are required to take GEOS2121/2921 and recommended to take at least one of the following units of study: BIOL2009/2909, BIOL2010/2910, BIOL2022/2922, BIOL2024/2924, GEOS2111/2911, GEOS2115/2915, GEOG2321, AREC2003*, LWSC2002* * Note AREC2003 and LWSC2002 are not Table 1 units of study			
GEOS2121 **Environmental and Resource Management**	6	**P** 6 credit points of first year Geosciences units or ECOP1001 or ECOP1002 **N** GEOS2921	Semester 2
GEOS2921 **Environmental and Resource Management (Adv)**	6	**P** A mark of 75 in a 6 credit point Junior Geosciences unit of study or a mark of 75 in ECOP1001 or ECOP1002 **N** GEOS2121	Semester 2
BIOL2009 **Intro to Terrestrial Field Ecology**	6	**A** Basic experimental design and statistical analysis. **P** 12cp from (BIOL1XXX, MBLG1XXX) **N** BIOL2909 or BIOL3009 or BIOL3909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered.*	Intensive July
BIOL2909 **Intro to Terrestrial Field Ecology (Adv)**	6	**A** Basic experimental design and statistical analysis. **P** An average of 75 or above in 12cp from (BIOL1XXX, MBLG1XXX) **N** BIOL2009 or BIOL3009 or BIOL3909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered.*	Intensive July

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL2010 **Intro to Tropical Wildlife Biology** *This unit of study is not available in 2018*	6	**P** 12cp from (BIOL1XXX, MBLG1XXX) **N** BIOL2910, BIOL3910, BIOL3010 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Departmental permission is required for entry into this unit of study. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered. The unit is only available in ODD years (2017, 2019), but students may apply for entry into an alternative intermediate field unit in EVEN years.*	Intensive February
BIOL2910 **Intro to Tropical Wildlife Biology (Adv)** *This unit of study is not available in 2018*	6	**P** An average of 75 or above in 12cp from (BIOL1XXX, MBLG1XXX) **N** BIOL2010 or BIOL3010 or BIOL3910 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered. The unit is only available in ODD years (2017, 2019), but students may apply for entry into an alternative intermediate field unit in EVEN years.*	Intensive February
BIOL2022 **Biology Experimental Design and Analysis**	6	**A** BIOL1XXX or MBLG1XXX **P** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **N** BIOL2922 or BIOL3006 or BIOL3906	Semester 2
BIOL2922 **Biol Experimental Design and Analysis Adv**	6	**A** BIOL1XXX or MBLG1XXX **P** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **N** BIOL2022 or BIOL3006 or BIOL3906	Semester 2
BIOL2024 **Ecology and Conservation**	6	**A** BIOL1XXX or MBLG1XXX **N** BIOL2924	Semester 2
BIOL2924 **Ecology and Conservation (Advanced)**	6	**A** BIOL1XXX or MBLG1XXX **P** An annual average mark of at least 70 in the previous year **N** BIOL2024	Semester 2
GEOS2111 **Natural Hazards: a GIS Approach**	6	**P** 6 credit points of Junior Geosciences units **N** GEOS2911 *Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.*	Semester 1
GEOS2911 **Natural Hazards: A GIS Approach (Adv)**	6	**P** A mark of 75 in a 6 credit point Junior Geosciences unit of study **N** GEOS2111 *Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.*	Semester 1
GEOS2115 **Oceans, Coasts and Climate Change**	6	**A** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **P** 24 credit points from Junior Units of Study **N** GEOS2915 or MARS2006	Intensive July Semester 1
GEOS2915 **Oceans, Coasts and Climate Change (Adv)**	6	**A** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **P** Distinction average in 48 credit points from Junior units of study. **N** GEOS2115 or MARS2006	Semester 1

Senior units of study

For a major in Environmental Studies, students are required to complete a minimum of 24 credit points from the Senior units of study listed here, including at least 12 credit points from Senior ENVI-coded units

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENVI3111 **Environmental Law and Ethics**	6	**P** 12 credit points of Intermediate units **N** ENVI3911	Semester 1
ENVI3911 **Environmental Law and Ethics (Advanced)**	6	**P** Distinction average across 12 credit points of Intermediate units **N** ENVI3111	Semester 1
ENVI3112 **Environmental Assessment**	6	**P** (GEOS2121 or GEOS2921) and 6 credit points of Intermediate units **N** ENVI3912	Semester 2
ENVI3912 **Environmental Assessment (Advanced)**	6	**P** Distinction average in ((GEOS2121 or GEOS2921) and 6 credit points of Intermediate units) **N** ENVI3112 *Supervised research project equivalent to the Literature Review in ENVI3112*	Semester 2
ENVI3114 **Energy and the Environment**	6	**A** Junior Physics units or Intermediate Environmental Science units **P** 12 credit points of Intermediate units **N** ENVI3001 or PHYS3600	Semester 2
BIOL3007 **Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3907	Semester 2
BIOL3907 **Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3007	Semester 2
GEOS3014 **GIS in Coastal Management**	6	**P** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **N** GEOS3914 or MARS3104	Semester 2
GEOS3914 **GIS in Coastal Management (Advanced)**	6	**P** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **N** GEOS3014 or MARS3104 *Note: Department permission required for enrolment* *A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.*	Semester 2
GEOS3520 **Urban Citizenship and Sustainability**	6	**P** 24 credit points of Intermediate units of study, including 6 credit points from the following (GEOS2112 or GEOS2912 or GEOS2123 or GEOS2923 or GEOS2115 or GEOS2915 or GEOS2121 or GEOS2921 or SOILS2002 or LWSC2002) **N** GEOS3920	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
GEOS3920 **Urban Citizenship and Sustainability (Adv)**	6	**P** Distinction average in 24 credit points of Intermediate units of study including 6 credit points from one of the following units: GEOS2112, GEOS2912, GEOS2123, GEOS2923, GEOS2115, GEOS2915, GEOS2121, GEOS2921, SOIL2002, LWSC2002 **N** GEOS3520	Semester 1
ECOS3013 **Environmental Economics**	6	**P** AREC2003 or RSEC2031 or ECOS2001 or ECOS2901	Semester 2

Environmental Studies

For a major in Environmental Studies, students are required to complete a minimum of 24 credit points from Senior units of study listed below, including at least 12 credit points from Senior ENVI units

Junior units of study

Students are recommended to take GEOS1001/1901 and at least one of the following units of study: BIOL1006/1906/1996, BIOL1007/1907/1997, GEOS1002/1902, GEOS1003/1903

GEOS1001
Earth, Environment and Society

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the gateway unit of study for Human Geography, Physical Geography, Environmental Studies and Geology. Its objective is to introduce the big questions relating to the origins and current state of the planet: climate change, environment, landscape formation, and the growth of the human population. During the semester you will be introduced to knowledge, theories and debates about how the world's physical and human systems operate. The first module investigates the evolution of the planet through geological time, with a focus on major Earth systems such as plate tectonics and mantle convection and their interaction with the atmosphere, hydrosphere, biosphere and human civilisations. The second module presents Earth as an evolving and dynamic planet, investigating global environmental change, addressing climate variability and human impacts on the natural environment and the rate at which these changes occur and how they have the potential to dramatically affect the way we live. Finally, the third module, focuses on human-induced challenges to Earth's future. This part of the unit critically analyses the relationships between people and their environments, with central consideration to debates on population change, resource use and the policy contexts of climate change mitigation and adaptation.

GEOS1901
Earth, Environment and Society Advanced

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1001, but will be required to carry out more challenging practical assignments.

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week

Prohibitions: BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks

Please see unit outline on LMS

Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks

Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

GEOS1002
Introductory Geography

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson, Dr Dan Penny **Session:** Semester 2 **Classes:** One 2 hour lecture per week and eight 2 hour practicals during semester. **Prohibitions:** GEOS1902 or GEOG1001 or GEOG1002 **Assessment:** One 2 hour exam, one 2000 word essay, two online quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a geographical perspective on the ways in which people interact with each other and the physical world, focussing on the processes that generate spatial variation and difference. Students will consider the development and characteristics of natural environments across the globe, and will explore how these environments both constrain, and are influenced by, humans. In the process, they will learn about the biophysical, political, economic, cultural and urban geographies that shape contemporary global society. Each of these themes will be discussed with reference to key examples, in order to understand the ways in which the various processes (both physical and human) interact. The unit of study is designed to attract and interest students who wish to pursue geography as a major within their undergraduate degree, but also has relevance to students who wish to learn how to think geographically about the contemporary world.

GEOS1902
Introductory Geography (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson, Dr Dan Penny **Session:** Semester 2 **Classes:** One 2 hour lecture per week and 8 2 hour practicals per semester, plus independent group work. **Prohibitions:** GEOS1002 or GEOG1001 or GEOG1002 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** One 2 hour exam, one 1000 word essay, two online quizzes, one practical report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1002, but will be required to carry out more challenging practical assignments.

GEOS1003
Introduction to Geology

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2, Summer Main **Classes:** Two 1 hour lectures and one 3 hour practical per week **Prohibitions:** GEOS1903 or GEOL1002 or GEOL1902 or GEOL1501 **Assessment:** One 2 hour exam, quizzes, tests, practical reports, field report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit of study is to examine the chemical and physical processes involved in mineral formation, the interior of the Earth, surface features, sedimentary environments, volcanoes, and metamorphism. Lectures and laboratory sessions on mountain building processes and the formation of mineral deposits will lead to an understanding of the forces controlling the geology of our planet. Processes such as weathering, erosion and nature of sedimentary environments are related to the origin of the Australian landscape. In addition to laboratory classes there is a one-day excursion to the western Blue Mountains and Lithgow to examine geological objects in their setting.

Textbooks

The recommended text is is Christiansen, E. H., and Hamblin, W. K. (2015). Dynamic earth: An introduction to physical geology. Burlington, MA: Jones and Bartlett Learning.

GEOS1903
Introduction to Geology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour practical per week, field classes. **Prohibitions:** GEOS1003 or GEOL1002 or GEOL1902 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** One 2 hour exam, tests, quizzes, practical reports, field report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit has the same objectives as GEOS1003 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their ATAR or UAI and/or their university performance at the time of enrolment. Students that elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. This unit may be taken as part of the BSc (Advanced).

Textbooks

The recommended text is Christiansen, E. H., and Hamblin, W. K. (2015). Dynamic earth: An introduction to physical geology. Burlington, MA: Jones and Bartlett Learning.

Intermediate units of study

Students are required to take GEOS2121/2921 and recommended to take at least one of the following units of study: BIOL2009/2909, BIOL2010/2910, BIOL2022/2922, BIOL2024/2924, GEOS2111/2911, GEOS2115/2915, GEOG2321, AREC2003*, LWSC2002** Note AREC2003 and LWSC2002 are not Table 1 units of study

GEOS2121
Environmental and Resource Management

Credit points: 6 **Teacher/Coordinator:** Dr Sophie Webber **Session:** Semester 2 **Classes:** Two hour lecture; one hour tutorial per week **Prerequisites:** 6 credit points of first year Geosciences units or ECOP1001 or ECOP1002 **Prohibitions:** GEOS2921 **Assessment:** One exam, one essay, one report, tutorial attendance (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are in the midst of an unprecedented global ecological and climatological crisis, and consequently need to transform our social, political and economic systems. This crisis Â¿ its causes, its effects, and its solutions Â¿ are geographically unevenly distributed and situated. Therefore, this unit of study uses geographical concepts to consider what has caused this global crisis, how we should think about the relations and interactions between humans and their environments, and what some strategies are for managing our environment and resources to negotiate this predicament. Using examples focused in Australia, Asia, and the Pacific region, students will learn how to integrate environmental, economic, political, social and cultural considerations and perspectives, and how to evaluate environmental and resource management policies and ideas.

GEOS2921
Environmental and Resource Management (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Sophie Webber **Session:** Semester 2 **Classes:** Two hour lecture; one hour tutorial per week **Prerequisites:** A mark of 75 in a 6 credit point Junior Geosciences unit of study or a mark of 75 in ECOP1001 or ECOP1002 **Prohibitions:** GEOS2121 **Assessment:** One exam, one essay, one report, tutorial attendance (100%) **Practical field work:** Seminar, maximum of four hours **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Advanced students will receive the same core lecture materials as for GEOS2121 but have a separate seminar and are required to complete alternative written work.

BIOL2009
Intro to Terrestrial Field Ecology

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** Note: One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** 12cp from (BIOL1XXX, MBLG1XXX) **Prohibitions:** BIOL2909 or BIOL3009 or BIOL3909 **Assumed knowledge:** Basic experimental design and statistical analysis. **Assessment:** Two in-class quizzes (20%), major research report (40%), sampling project report (20%), research proposal and presentation (10%), data collection and analysis in teams (10%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Field experience

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered.

This intensive field-based course provides a practical introduction in the experimental analysis of terrestrial populations and assemblages. The experience is best suited to students who will continue into senior units of study in ecology. Students learn a broad range of ecological sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. The field work takes place in native forest and incorporates survey techniques for plants, small mammals and other fauna and thus provides a good background for ecological consulting work and an introduction into large-scale project management. Students attend a week-long field course and participate in a large-scale research project as part of a large team, as well as conducting a research project that they design with a small group of students. Emphasis is placed on critical thinking in the context of environmental management and technical skills are developed in the area of data handling and analysis, report writing and team work. Invited experts contribute to the lectures and discussions on issues relating to the ecology, conservation and management of Australia's terrestrial flora and fauna.

BIOL2909
Intro to Terrestrial Field Ecology (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** Note: One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** An average of 75 or above in 12cp from (BIOL1XXX, MBLG1XXX) **Prohibitions:** BIOL2009 or BIOL3009 or BIOL3909 **Assumed knowledge:** Basic experimental design and statistical analysis. **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), specimen collection (10%), research project report (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Field experience

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered.

This unit has the same objectives as BIOL2009 Terrestrial Field Ecology, and is suitable for qualified students who wish to pursue certain aspects at a more advanced level. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study will participate in alternatives to some elements of the standard course and will be required to pursue the objectives by more independent means. Specific details of this unit of study and assessment will be announced in meetings with students at the beginning of the unit.

This intensive field-based course provides a practical introduction in the experimental analysis of terrestrial populations and assemblages. The experience is best suited to students who will continue into senior units of study in ecology. Students learn a broad range of ecological sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. The field work takes place in native forest and incorporates survey techniques for plants, small mammals and other fauna and thus provides a good background for ecological consulting work and an introduction into large-scale project management. Students attend a week-long field course and participate in a large-scale research project as part of a large team as well as conducting a research project that they design with a small group of students. Emphasis is placed on critical thinking in the context of environmental management and technical skills are developed in the area of data handling and analysis, report writing and team work. Invited experts contribute to the lectures and discussions on issues relating to the ecology, conservation and management of Australia's terrestrial flora and fauna.

BIOL2010
Intro to Tropical Wildlife Biology

Credit points: 6 **Teacher/Coordinator:** Dr Matthew Greenlees **Session:** Intensive February **Classes:** One week intensive field trip to the Northern Territory plus one week intensive lecture and prac session at Sydney University. **Prerequisites:** 12cp from (BIOL1XXX, MBLG1XXX) **Prohibitions:** BIOL2910, BIOL3910, BIOL3010 **Assessment:** Practical exam (15%), Presentation (15%), Reports (30%), Theory exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Field experience

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Departmental permission is required for entry into this unit of study. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered. The unit is only available in ODD years (2017, 2019), but students may apply for entry into an alternative intermediate field unit in EVEN years.

Australia has a unique terrestrial vertebrate fauna and native wildlife management presents special challenges for biologists, conservationists and land managers because of Australia's climate, landforms, and the rarity of many species. This unit of study considers fundamental questions in biology by addressing the biogeography, ecology and management of Australia's terrestrial fauna, with a focus on the wet-dry tropical savannah woodlands. Study in this unit includes a one-week field trip at Mary River Park in the Northern Territory and at Litchfield National Park. Professional biologists working on a range of environmental issues in wet-dry tropical woodlands from the Northern Territory will present guest lecturers to students and, in the field, students will track and identify wildlife and conduct faunal surveys. The fieldtrip is followed by a one-week intensive of lectures and prac sessions on Camperdown campus. This unit of study provides a suitable foundation for senior biology units of study.

BIOL2910
Intro to Tropical Wildlife Biology (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Matthew Greenlees **Session:** Intensive February **Classes:** One week intensive field trip to the Northern Territory plus one week intensive lecture and prac session at Sydney University. **Prerequisites:** An average of 75 or above in 12cp from (BIOL1XXX, MBLG1XXX) **Prohibitions:** BIOL2010 or BIOL3010 or BIOL3910 **Assessment:** Practical exam (15%), Presentation (15%), Reports (30%), Theory exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Field experience

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered. The unit is only available in ODD years (2017, 2019), but students may apply for entry into an alternative intermediate field unit in EVEN years.

The content will be based on the standard unit BIOL2010 but qualified students will participate in alternative components at a more advanced level.The content and nature of these components may vary from year to year.Australia has a unique terrestrial vertebrate fauna. Because of Australia's unusual climate, landforms, and the rarity of many species, the management of our native wildlife presents special challenges for biologists, conservationists and land managers. This unit of study addresses the biogeography, ecology and management of Australia's terrestrial fauna, with a focus on the wet-dry tropical savannah woodlands. It comprises a one-week field trip at Mary River Park in the Northern Territory plus one week intensive lecture and prac session. The unit of study will provide students with an exciting, hands-on first experience of terrestrial field ecology. During the trip, students will learn how to carry out fauna surveys, how to identify animals, and how to track wildlife. Biologists working on a range of environmental issues in wet-dry tropical woodlands will present guest lectures to students during the field trip. Students will travel to other locations including Litchfield National Park on the last day to introduce them to the various habitats occurring in the Top End.

BIOL2022
Biology Experimental Design and Analysis

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **Prohibitions:** BIOL2922 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides foundational skills essential for doing research in biology and for critically judging the research of others. We consider how biology is practiced as a quantitative, experimental and theoretical science. We focus on the underlying principles and practical skills you need to explore questions and test hypotheses, particularly where background variation (error) is inherently high. In so doing, the unit provides you with an understanding of how biological research is designed, analysed and interpreted using statistics. Lectures focus on sound experimental and statistical principles, using examples in ecology and other fields of biology to demonstrate concepts. In the practical sessions, you will design and perform, analyse (using appropriate statistical tools) and interpret your own experiments to answer research questions in topics relevant to your particular interest. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and M. J. Keough. 2002. Experimental Design and Data Analysis for Biologists. 1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2922
Biol Experimental Design and Analysis Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **Prohibitions:** BIOL2022 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2922 will be based on BIOL2022 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and Keough, 2002. Experimental Design and Data Analysis for Biologists.1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2024
Ecology and Conservation

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prohibitions:** BIOL2924 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines the ecological principles driving the major ecosystems of the world and ecological processes behind the world's major conservation issues. It aims to develop in students the core foundations for an understanding of Ecology and its application in conservation. Lectures will focus on the ecology of the major terrestrial and marine biomes of the world. Application of ecological theory and methods to practical conservation problems will be integrated throughout the unit of study. Practical sessions will provide hands-on experience in ecological sampling and data handling to understand the ecology of marine and terrestrial environments, as well as ecological simulations to understand processes. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John
Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

BIOL2924
Ecology and Conservation (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An annual average mark of at least 70 in the previous year **Prohibitions:** BIOL2024 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2924 will be based on BIOL2024 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John
Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

GEOS2111
Natural Hazards: a GIS Approach

Credit points: 6 **Teacher/Coordinator:** A/Prof Dale Dominey-Howes **Session:** Semester 1 **Classes:** Two hour lecture; two hour practical/tute/lab **Prerequisites:** 6 credit points of Junior Geosciences units **Prohibitions:** GEOS2911 **Assessment:** One 2 hour exam, three reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.

The unit provides an essential framework for understanding the environmental response to short- and long-term geologic, oceanic and atmospheric processes. This Unit of Study introduces students to a variety of natural phenomena that affect society with impact levels ranging from nuisance to disastrous. The discussion of each hazard focuses on: (1) the process mechanics, (2) hazards and risk, and (3) methods for mitigation. Geographic Information Systems (GIS) are used by scientists, planners, policy-makers and the insurance industry alike to address many issues relating to natural hazards. This Unit of Study will introduce students to the major concepts relating to GIS and provide practical experience in the application of GIS techniques to hazard mapping, risk assessment and mitigation.

Textbooks

No prescribed textbook

GEOS2911
Natural Hazards: A GIS Approach (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dale Dominey-Howes **Session:** Semester 1 **Classes:** Two hour lecture; two hour practical/tute/lab **Prerequisites:** A mark of 75 in a 6 credit point Junior Geosciences unit of study **Prohibitions:** GEOS2111 **Assessment:** One 2 hour exam, three reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.

This unit has the same objectives as GEOS2111 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives.

Textbooks

No set textbook

GEOS2115
Oceans, Coasts and Climate Change

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Müller, A/Prof Jody Webster, A.Prof Ana Vila-Concejo **Session:** Intensive July, Semester 1 **Classes:** Twenty-five 1 hour lectures, three 1 hour workshops, eight 2 hour practical classes. **Prerequisites:** 24 credit points from Junior Units of Study **Prohibitions:** GEOS2915 or MARS2006 **Assumed knowledge:** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **Assessment:** Lab reports (60%), one 2-hour exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces core concepts about how the formation of ocean basins and their influence on climate govern the development of coasts and continental margins. These concepts provide a framework for understanding the geographic variation of coasts, continental shelves and sediment accumulations in the deep ocean. Ocean-basin evolution is explained in terms of movements within the Earth's interior and how these movements determine the geometry of ocean basins, and their alpine counterparts, which interact with the global circulation of the ocean and atmosphere. This interaction plays a key role in marine sedimentation and controls the environmental conditions responsible for the development of coral reefs and other ecosystems. The Unit of Study systematically outlines how these factors have played out to produce, by gradual change, the coasts we see today, as well as the less familiar deposits hidden beneath the sea and coastal lands. The Unit thereby outlines how knowledge of responses to climate change in the past allow us to predict environmental responses to accelerated climate change occurring now and in the future due to the industrial greenhouse effect, but places these responses into perspective against the geological record. Overall therefore, the Unit aims to provide familiarity with fundamental phenomena central to the study of marine geoscience and environmental impacts, introduced through process-oriented explanations. The Unit of Study is structured around GIS-based practical sessions and problem-based project work, for which lectures provide the theoretical background.

Textbooks

On line reading material provided via Fisher Library

GEOS2915
Oceans, Coasts and Climate Change (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Muller **Session:** Semester 1 **Classes:** Twenty-five 1 hour lectures, three 1 hour workshops, eight 2 hour practical classes. **Prerequisites:** Distinction average in 48 credit points from Junior units of study. **Prohibitions:** GEOS2115 or MARS2006 **Assumed knowledge:** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **Assessment:** Lab reports (60%), one 2 hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as GEOS2115 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives.

Textbooks

Online reading materials are provided via Fisher Library.

Senior units of study

For a major in Environmental Studies, students are required to complete a minimum of 24 credit points from the Senior units of study listed here, including at least 12 credit points from Senior ENVI-coded units

ENVI3111
Environmental Law and Ethics

Credit points: 6 **Teacher/Coordinator:** Dr Josephine Gillespie **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate units **Prohibitions:** ENVI3911 **Assessment:** Essays, in-class tests, tutorials, exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Environmental regulation and governance plays an important role in regulating human impacts on the environment. This unit provides an introduction to environmental regulation. We investigate key environmental issues through an examination of environmental policies, legislation and case law at a variety of scales (international, national and state/local). The ethics component helps students develop thoughtful and informed positions on issues in environmental ethics. The aim of this Unit is to enable students to understand the broad principles of environmental law and ethics and to apply this understanding to contemporary environmental problems.

ENVI3911
Environmental Law and Ethics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Josephine Gillespie **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Distinction average across 12 credit points of Intermediate units **Prohibitions:** ENVI3111 **Assessment:** Essays, tutorial attendance, exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This advanced unit of study will cover the same core lecture material as for ENVI3111, but students will be required to carry out more challenging practical assignments based on a fieldtrip activity.

ENVI3112
Environmental Assessment

Credit points: 6 **Teacher/Coordinator:** Prof Phil McManus **Session:** Semester 2 **Classes:** One 2-hour lecture per week and one 2-hour tutorial/practical per week. **Prerequisites:** (GEOS2121 or GEOS2921) and 6 credit points of Intermediate units **Prohibitions:** ENVI3912 **Assessment:** Literature review, group report, presentation, exam (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study focuses on environmental impact assessment as part of environmental planning. It seeks to establish a critical understanding of environmental planning and the tools available to improve environmental outcomes. The unit of study addresses the theory and practice of environmental impact statements (EIS) and environmental impact assessment processes (EIA) from scientific, economic, social and cultural value perspectives. Emphasis is placed on gaining skills in group work and in writing and producing an assessment report, which contains logically ordered and tightly structured argumentation that can stand rigorous scrutiny by political processes, the judiciary, the public and the media.

ENVI3912
Environmental Assessment (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Phil McManus **Session:** Semester 2 **Classes:** One 2-hour lecture per week and one 2-hour tutorial/practical per week. **Prerequisites:** Distinction average in ((GEOS2121 or GEOS2921) and 6 credit points of Intermediate units) **Prohibitions:** ENVI3112 **Assessment:** Research project, group report, presentation, exam (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Supervised research project equivalent to the Literature Review in ENVI3112

This advanced unit of study will cover the same core lecture, tutorial and group practical material as for ENVI3112. The difference in the Advanced unit of study is that students will be required to write a 3000-word essay that is worth 40% of their semester marks, rather than writing a literature review. The essay will explore the more theoretical and conceptual debates within impact assessment.

ENVI3114
Energy and the Environment

Credit points: 6 **Teacher/Coordinator:** Dr Arne Geschke **Session:** Semester 2 **Classes:** 2-hour lecture and 1 hour seminar per week; field trips **Prerequisites:** 12 credit points of Intermediate units **Prohibitions:** ENVI3001 or PHYS3600 **Assumed knowledge:** Junior Physics units or Intermediate Environmental Science units **Assessment:** Essay, comprehensive diary/notes from lectures, and presentation (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers many aspects of energy and the environment: energy resources and use; electrical power generation including fossil fuelled and alternate methods; environmental impacts of energy use and power generation including greenhouse gas emissions; transportation and pollution; energy management in buildings; solar thermal energy, photovoltaics, wind power and nuclear energy; embodied energy and net emissions analysis and, importantly, socio-economic and political issues related to energy provision.

BIOL3007
Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3907 **Assessment:** One 2-hour exam, group presentations, one essay, one project report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the dynamics of ecological systems, and considers the interactions between individual organisms and populations, organisms and the environment, and ecological processes. Lectures are grouped around four dominant themes: Interactions, Evolutionary Ecology, The Nature of Communities, and Conservation and Management. Emphasis is placed throughout on the importance of quantitative methods in ecology, including sound planning and experimental designs, and on the role of ecological science in the conservation, management, exploitation and control of populations. Relevant case studies and examples of ecological processes are drawn from marine, freshwater and terrestrial systems, with plants, animals, fungi and other life forms considered as required. Students will have some opportunity to undertake short term ecological projects, and to take part in discussions of important and emerging ideas in the ecological literature.

Textbooks

Begon M, Townsend CR, Harper JL (2005) Ecology, From individuals to ecosystems. Wiley-Blackwell.

BIOL3907
Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two lectures per week, weekly tutorial and 3-hour practical per week **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3007 **Assessment:** One 2-hour exam, presentations, one essay, one project report (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as BIOL3007 Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study participate in alternatives to some elements of the standard course and will be encouraged to pursue the objectives by more independent means in a series of research tutorials. Specific details of this unit of study and assessment will be announced in meetings with students in week 1 of semester 2. This unit of study may be taken as part of the BSc (Advanced) program.

Textbooks
As for BIOL3007

GEOS3014
GIS in Coastal Management

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** 2x1 hour lectures and 1x3h practical/week **Prerequisites:** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **Prohibitions:** GEOS3914 or MARS3104 **Assessment:** One 2 hour exam, two project reports, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Coastal Management is about how scientific knowledge is used to support policy formulation and planning decisions in coastal environments. The course links coastal science to policy and practice in management of estuaries, beaches and the coastal ocean. The principles are exemplified through specific issues, such as coastal erosion, pollution, and impacts of climate-change. The issues are dealt with in terms of how things work in nature, and how the issues are handled through administrative mechanisms. These mechanisms involve planning strategies like Marine Protected Areas and setback limits on civil development in the coastal zone. The coastal environments and processes that are more relevant to coastal management including: rocky coasts; beaches, barriers and dunes; and coral reefs will also be introduced. At a practical level, the link between science and coastal management is given substance through development and use of 'decision-support models'. These models involve geocomputing methods that entail application of simulation models, remotely sensed information, and Geographic Information Systems (GIS). The course therefore includes both principles and experience in use of these methods to address coastal-management issues. (It thus also involves extensive use of computers.) Although the focus is on the coast, the principles and methods have broader relevance to environmental management in particular, and to problem-solving in general. That is, the course has vocational relevance in examining how science can be exploited to the benefit of society and nature conservation.

GEOS3914
GIS in Coastal Management (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** Two hours of lectures, one 3 hour practical per week comprising one 1 hour practical demonstration and one 2 hour practical **Prerequisites:** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **Prohibitions:** GEOS3014 or MARS3104 **Assessment:** One 2 hour exam, project work, two practical-based project reports, fortnightly progress quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3014 but will carry out more challenging projects, practicals, assignments and tutorials.

GEOS3520
Urban Citizenship and Sustainability

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** 2 hour lecture and 1 hour tutorial per week, six 2 hours practical sessions. **Prerequisites:** 24 credit points of Intermediate units of study, including 6 credit points from the following (GEOS2112 or GEOS2912 or GEOS2123 or GEOS2923 or GEOS2115 or GEOS2915 or GEOS2121 or GEOS2921 or SOILS2002 or LWSC2002) **Prohibitions:** GEOS3920 **Assessment:** One 2hr exam, one 2000w essay, one 2000w group-based prac report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cities are now the predominant home for humanity. More than half of the world's population reside in cities. The contemporary growth of cities, however, is attached to profound political questions about what it means to be urban, and what 'being urban' means for the planet. This Unit of Study provides grounding to these crucial questions. In the first half of the semester, lectures address the question: are cities sustainable? Why or why not? And for whom? This focus addresses utopian visions for cities, urban history, ecological footprint analysis, bioregionalism, transport options, urban form and urban policy, with reference to sustainable futures and the role of custodianship. During the second half of the semester, lectures address the question: what does it mean to be a 'citizen', and what has this got to do with cities and different approaches to urban sustainability? This includes consideration of historical and contemporary configurations of citizenship. Case studies illustrate ways in which new forms of citizenship are produced through struggles over rights to the city and the urban environment. Through the semester a practicals program enables students to develop urban-based research projects.

GEOS3920
Urban Citizenship and Sustainability (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** 2 hour lecture and 2 hour tutorial per week **Prerequisites:** Distinction average in 24 credit points of Intermediate units of study including 6 credit points from one of the following units: GEOS2112, GEOS2912, GEOS2123, GEOS2923, GEOS2115, GEOS2915, GEOS2121, GEOS2921, SOIL2002, LWSC2002 **Prohibitions:** GEOS3520 **Assessment:** One 2hr exam, one 2000w essay, one 2000w group-based prac report. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS3920 has the same thematic content as GEOS3520 however with elements taught at an Advanced level

ECOS3013
Environmental Economics

Credit points: 6 **Session:** Semester 2 **Classes:** 1x2hr lecture/week, 1x1hr tutorial/week **Prerequisites:** AREC2003 or RSEC2031 or ECOS2001 or ECOS2901 **Assessment:** 1x1500wd Essay (25%), 1hr Mid-semester test (25%), 1x2hr Final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The natural environment is invariably affected by production and consumption in our modern economy. In particular, environmental outcomes are important in the presence of market failures (externalities and public goods). This unit focuses on developing a student's detailed understanding of the economic techniques used by policymakers to address environmental issues. These techniques include: Pigovian taxes and subsidies; regulation with asymmetric information; marketable permits; pricing contributions for public goods; optimal damages; and the allocation of property-rights and market failures.

Table 1: Financial Mathematics and Statistics

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Financial Mathematics and Statistics			
For a major in Financial Mathematics and Statistics, students are required to complete: (i) MATH3075/3975; (ii) STAT3011/3911; (iii) STAT3012/3912; and (iv) One of the following units of study: STAT3013/3913, STAT3014/3914, MATH3076/3976, MATH3078/3978, MATH3969, MATH3974 or INFO3404/3504			
Junior units of study			
MATH1021 **Calculus Of One Variable**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931	Semester 1
MATH1921 **Calculus Of One Variable (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 *Note: Department permission required for enrolment*	Semester 1
MATH1931 **Calculus Of One Variable (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 1
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1012 or MATH1014 or MATH1902	Semester 1 Summer Main
MATH1902 **Linear Algebra (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1002 or MATH1012 or MATH1014 *Note: Department permission required for enrolment*	Semester 1
MATH1023 **Multivariable Calculus and Modelling**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933	Semester 2
MATH1923 **Multivariable Calculus and Modelling (Adv)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 *Note: Department permission required for enrolment*	Semester 2
MATH1933 **Multivariable Calculus and Modelling (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 2
MATH1005 **Statistical Thinking with Data**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020	Semester 2 Summer Main Winter Main
MATH1905 **Statistical Thinking with Data (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 *Note: Department permission required for enrolment*	Semester 2
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **C** MATH1003 or MATH1903 **N** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001.	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 1 or MATH1001 or MATH1011 or a credit or higher in MATH1111. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1013 or MATH1903 or MATH1907	Summer Main
DATA1001 **Foundations of Data Science**	6	**N** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021	Semester 1 Semester 2
Intermediate units of study			
DATA2002 **Data Analytics: Learning from Data**	6	**A** (Basic Linear Algebra and some coding) or QBUS1040 **P** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **N** STAT2012 or STAT2912	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MATH2070 **Optimisation and Financial Mathematics**	6	**A** MATH1X23 or MATH1933 or MATH1X03 or MATH1907 **P** (MATH1X21 or MATH1011 or MATH1931 or MATH1X01 or MATH1906) and (MATH1014 or MATH1X02) **N** MATH2010 or MATH2033 or MATH2933 or MATH2970 or ECMT3510 *Students may enrol in both MATH2070 and MATH3075 in the same semester*	Semester 2
MATH2970 **Optimisation and Financial Mathematics Adv**	6	**A** MATH19X3 or MATH1907 or a mark of 65 or above in MATH1003 or MATH1023 **P** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **N** MATH2010 or MATH2033 or MATH2933 or MATH2070 or ECMT3510 *Students may enrol in both MATH2970 and MATH3975 in the same semester*	Semester 2
STAT2011 **Probability and Estimation Theory**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **N** STAT2901 or STAT2001 or STAT2911	Semester 1
STAT2911 **Probability and Statistical Models (Adv)**	6	**P** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **N** STAT2001 or STAT2901 or STAT2011	Semester 1
STAT2912 **Statistical Tests (Advanced)**	6	**A** STAT2911 **P** MATH1905 or Credit in MATH1005 or Credit in ECMT1010 or Credit in BUSS1020 **N** STAT2012 or STAT2004 or DATA2002	Semester 2
Senior core units of study			
MATH3075 **Financial Mathematics**	6	**P** 12 credit points of Intermediate Mathematics, including (MATH2070 or MATH2970) **N** MATH3975 or MATH3015 or MATH3933	Semester 2
MATH3975 **Financial Mathematics (Advanced)**	6	**P** Credit average or greater in 12 credit points of Intermediate Mathematics (including MATH2070 or MATH2970) **N** MATH3933 or MATH3015 or MATH3075	Semester 2
STAT3011 **Stochastic Processes and Time Series**	6	**P** STAT2X11 and (MATH1X03 or MATH1907 or MATH1X23 or MATH1933). **N** STAT3911 or STAT3903 or STAT3003 or STAT3905 or STAT3005	Semester 1
STAT3911 **Stochastic Processes and Time Series Adv**	6	**P** (STAT2911 or a mark of 65 or above in STAT2011) and (MATH1X03 or MATH1907 or MATH1X23 or MATH1933) **N** STAT3011 or STAT3905 or STAT3005 or STAT3003 or STAT3903	Semester 1
STAT3012 **Applied Linear Models**	6	**P** (DATA2002 or STAT2X12) and (MATH1X02 or MATH1014) **N** STAT3002 or STAT3004 or STAT3902 or STAT3912 or STAT3904	Semester 1
STAT3912 **Applied Linear Models (Advanced)**	6	**P** [STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002)] and (MATH2X61 or MATH1902 or MATH2X22) **N** STAT3012 or STAT3002 or STAT3902 or STAT3004 or STAT3904	Semester 1
Senior elective units of study			
STAT3013 **Statistical Inference**	6	**P** STAT2X11 and (DATA2002 or STAT2X12) **N** STAT3913 or STAT3001 or STAT3901	Semester 2
STAT3913 **Statistical Inference Advanced**	6	**P** STAT2911 and (DATA2002 or STAT2X12) **N** STAT3013 or STAT3901 or STAT3001	Semester 2
STAT3014 **Applied Statistics**	6	**A** STAT3012 or STAT3912 **P** DATA2002 or STAT2X12 **N** STAT3914 or STAT3002 or STAT3902 or STAT3006	Semester 2
STAT3914 **Applied Statistics Advanced**	6	**A** STAT3912 **P** STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002) **N** STAT3014 or STAT3907 or STAT3902 or STAT3006 or STAT3002	Semester 2
MATH3076 **Mathematical Computing**	6	**P** 12 credit points of MATH2XXX and 6 credit points from (MATH1021 or MATH1001 or MATH1023 or MATH1003 or MATH19X1 or MATH19X3 or MATH1906 or MATH1907) **N** MATH3976 or MATH3016 or MATH3916	Semester 1
MATH3976 **Mathematical Computing (Advanced)**	6	**P** 12 credit points of MATH2XXX and [6 credit points from (MATH1923 or MATH1903 or MATH1933 or MATH1907), or a mark of 65 or above in (MATH1023 or MATH1003)] **N** MATH3076 or MATH3016 or MATH3916	Semester 1
MATH3078 **PDEs and Waves**	6	**A** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **P** 12 credit points of Intermediate Mathematics **N** MATH3018 or MATH3921 or MATH3978	Semester 2
MATH3978 **PDEs and Waves (Advanced)**	6	**A** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3078 or MATH3018 or MATH3921	Semester 2
MATH3969 **Measure Theory and Fourier Analysis (Adv)**	6	**A** At least 6 credit points of (Intermediate Advanced Mathematics or Senior Advanced Mathematics units) **P** Credit average or greater in 12 credit points Intermediate Mathematics **N** MATH3909	Semester 2
MATH3974 **Fluid Dynamics (Advanced)**	6	**A** [MATH2961 and MATH2965] or [MATH2921 and MATH2922] **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3914	Semester 1
DATA3404 **Data Science Platforms**	6	**A** This unit of study assumes that students have previous knowledge of database structures and of SQL. The prerequisite material is covered in DATA2001 or ISYS2120. Familiarity with a programming language (e.g. Java or C) is also expected. **P** DATA2001 OR ISYS2120 OR INFO2120 OR INFO2820 **N** INFO3504 OR INFO3404	Semester 1

Financial Mathematics and Statistics

For a major in Financial Mathematics and Statistics, students are required to complete:(i) MATH3075/3975;(ii) STAT3011/3911;(iii) STAT3012/3912; and(iv) One of the following units of study: STAT3013/3913, STAT3014/3914, MATH3076/3976, MATH3078/3978, MATH3969, MATH3974 or INFO3404/3504

Junior units of study

MATH1021
Calculus Of One Variable

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals.

Textbooks

As set out in the Junior Mathematics Handbook.

MATH1921
Calculus Of One Variable (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals. Additional theoretical topics included in this advanced unit include the Intermediate Value Theorem, Rolle's Theorem, and the Mean Value Theorem.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1931
Calculus Of One Variable (SSP)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1921 Calculus of One Variable (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

MATH1002
Linear Algebra

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1014 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1002 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study introduces vectors and vector algebra, linear algebra including solutions of linear systems, matrices, determinants, eigenvalues and eigenvectors.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1902
Linear Algebra (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1002 or MATH1012 or MATH1014 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. It parallels the normal unit MATH1002 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1023
Multivariable Calculus and Modelling

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1923
Multivariable Calculus and Modelling (Adv)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable. Additional topics covered in this advanced unit of study include the use of diagonalisation of matrices to study systems of linear equation and optimisation problems, limits of functions of two or more variables, and the derivative of a function of two or more variables.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1933
Multivariable Calculus and Modelling (SSP)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1923 Multivariable Calculus and Modelling (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

MATH1005
Statistical Thinking with Data

Credit points: 3 **Session:** Semester 2, Summer Main, Winter Main **Classes:** Lectures 2 hrs/week; Practical 1 hr/week **Prohibitions:** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

In a data-rich world, global citizens need to problem solve with data, and evidence based decision-making is essential is every field of research and work.

This unit equips you with the foundational statistical thinking to become a critical consumer of data. You will learn to think analytically about data and to evaluate the validity and accuracy of any conclusions drawn. Focusing on statistical literacy, the unit covers foundational statistical concepts, including the design of experiments, exploratory data analysis, sampling and tests of significance.

Textbooks

Freedman, Pisani and Purves, Statistics, Norton, 2007

MATH1905
Statistical Thinking with Data (Advanced)

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. This Advanced level unit of study parallels the normal unit MATH1005 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1001
Differential Calculus

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Corequisites:** MATH1003 or MATH1903 **Prohibitions:** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001. **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1001 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. This unit of study looks at complex numbers, functions of a single variable, limits and continuity, vector functions and functions of two variables. Differential calculus is extended to functions of two variables. Taylor's theorem as a higher order mean value theorem.

Textbooks

As set out in the Junior Mathematics Handbook.

MATH1003
Integral Calculus and Modelling

Credit points: 3 **Session:** Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1013 or MATH1903 or MATH1907 **Assumed knowledge:** HSC Mathematics Extension 1 or MATH1001 or MATH1011 or a credit or higher in MATH1111. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1003 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.This unit of study first develops the idea of the definite integral from Riemann sums, leading to the Fundamental Theorem of Calculus. Various techniques of integration are considered, such as integration by parts.The second part is an introduction to the use of first and second order differential equations to model a variety of scientific phenomena.

Textbooks

As set out in the Junior Mathematics Handbook

DATA1001
Foundations of Data Science

Credit points: 6 **Teacher/Coordinator:** Dr Di Warren **Session:** Semester 1, Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prohibitions:** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021 **Assessment:** assignments, quizzes, presentation, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

DATA1001 is a foundational unit in the Data Science major. The unit focuses on developing critical and statistical thinking skills for all students. Does mobile phone usage increase the incidence of brain tumours? What is the public's attitude to shark baiting following a fatal attack? Statistics is the science of decision making, essential in every industry and undergirds all research which relies on data. Students will use problems and data from the physical, health, life and social sciences to develop adaptive problem solving skills in a team setting. Taught interactively with embedded technology, DATA1001 develops critical thinking and skills to problem-solve with data. It is the prerequisite for DATA2002.

Textbooks

Statistics, Fourth Edition, Freedman Pisani Purves

Intermediate units of study

DATA2002
Data Analytics: Learning from Data

Credit points: 6 **Teacher/Coordinator:** Jean Yang **Session:** Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prerequisites:** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **Prohibitions:** STAT2012 or STAT2912 **Assumed knowledge:** (Basic Linear Algebra and some coding) or QBUS1040 **Assessment:** written assignment, presentation, exams **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Technological advances in science, business, engineering has given rise to a proliferation of data from all aspects of our life. Understanding the information presented in these data is critical as it enables informed decision making into many areas including market intelligence and science. DATA2002 is an intermediate course in statistics and data sciences, focusing on learning data analytic skills for a wide range of problems and data. How should the Australian government measure and report employment and unemployment? Can we tell the difference between decaffeinated and regular coffee ? In this course, you will learn how to ingest, combine and summarise data from a variety of data models which are typically encountered in data science projects as well as reinforcing their programming skills through experience with statistical programming language. You will also be exposed to the concept of statistical machine learning and develop the skill to analyze various types of data in order to answer a scientific question. From this unit, you will develop knowledge and skills that will enable you to embrace data analytic challenges stemming from everyday problems.

MATH2070
Optimisation and Financial Mathematics

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** (MATH1X21 or MATH1011 or MATH1931 or MATH1X01 or MATH1906) and (MATH1014 or MATH1X02) **Prohibitions:** MATH2010 or MATH2033 or MATH2933 or MATH2970 or ECMT3510 **Assumed knowledge:** MATH1X23 or MATH1933 or MATH1X03 or MATH1907 **Assessment:** One 2 hour exam, assignments, quiz, project (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students may enrol in both MATH2070 and MATH3075 in the same semester

Problems in industry and commerce often involve maximising profits or minimising costs subject to constraints arising from resource limitations. The first part of this unit looks at programming problems and their solution using the simplex algorithm; nonlinear optimisation and the Kuhn Tucker conditions.

The second part of the unit deals with utility theory and modern portfolio theory. Topics covered include: pricing under the principles of expected return and expected utility; mean-variance Markowitz portfolio theory, the Capital Asset Pricing Model, log-optimal portfolios and the Kelly criterion; dynamical programming. Some understanding of probability theory including distributions and expectations is required in this part.

Theory developed in lectures will be complemented by computer laboratory sessions using MATLAB. Minimal computing experience will be required.

MATH2970
Optimisation and Financial Mathematics Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week (lectures given in common with MATH2070). **Prerequisites:** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **Prohibitions:** MATH2010 or MATH2033 or MATH2933 or MATH2070 or ECMT3510 **Assumed knowledge:** MATH19X3 or MATH1907 or a mark of 65 or above in MATH1003 or MATH1023 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students may enrol in both MATH2970 and MATH3975 in the same semester

The content of this unit of study parallels that of MATH2070, but students enrolled at Advanced level will undertake more advanced problem solving and assessment tasks, and some additional topics may be included.

STAT2011
Probability and Estimation Theory

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory week. **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **Prohibitions:** STAT2901 or STAT2001 or STAT2911 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to univariate techniques in data analysis and the most common statistical distributions that are used to model patterns of variability. Common discrete random models like the binomial, Poisson and geometric, continuous models including the normal and exponential will be studied along with elementary regression models. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2911
Probability and Statistical Models (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **Prohibitions:** STAT2001 or STAT2901 or STAT2011 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an advanced version of STAT2011, with an emphasis on the mathematical techniques used to manipulate random variables and probability models. Common distributions including the Poisson, normal, beta and gamma families as well as the bivariate normal are introduced. Moment generating functions and convolution methods are used to understand the behaviour of sums of random variables. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The notions of conditional expectation and prediction will be covered as will be distributions related to the normal: chi^2, t and F. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2912
Statistical Tests (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** MATH1905 or Credit in MATH1005 or Credit in ECMT1010 or Credit in BUSS1020 **Prohibitions:** STAT2012 or STAT2004 or DATA2002 **Assumed knowledge:** STAT2911 **Assessment:** One 2-hour exam, assignments and/or quizzes, computer practical reports and one computer practical exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an advanced version of STAT2012 with an emphasis on both methods and the mathematical derivation of these methods: Tests of hypotheses and confidence intervals, including t-tests, analysis of variance, regression - least squares and robust methods, power of tests, non-parametric methods, non-parametric smoothing, tests for count data, goodness of fit, contingency tables. Graphical methods and diagnostic methods are used throughout with all analyses discussed in the context of computation with real data using an interactive statistical package.

Senior core units of study

MATH3075
Financial Mathematics

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate Mathematics, including (MATH2070 or MATH2970) **Prohibitions:** MATH3975 or MATH3015 or MATH3933 **Assessment:** Two class quizzes and one 2 hour exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an introduction to the mathematical theory of modern finance. Topics include: notion of arbitrage, pricing riskless securities, risky securities, utility theory, fundamental theorems of asset pricing, complete markets, introduction to options, binomial option pricing model, discrete random walks, Brownian motion, derivation of the Black-Scholes option pricing model, extensions and introduction to pricing exotic options, credit derivatives. A strong background in mathematical statistics and partial differential equations is an advantage, but is not essential. Students completing this unit have been highly sought by the finance industry, which continues to need graduates with quantitative skills. The lectures in the Normal unit are held concurrently with those of the corresponding Advanced unit.

MATH3975
Financial Mathematics (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics (including MATH2070 or MATH2970) **Prohibitions:** MATH3933 or MATH3015 or MATH3075 **Assessment:** Two class quizzes and one 2 hour exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an introduction to the mathematical theory of modern finance. Topics include: notion of arbitrage, pricing riskless securities, risky securities, utility theory, fundamental theorems of asset pricing, complete markets, introduction to options, binomial option pricing model, discrete random walks, Brownian motion, derivation of the Black-Scholes option pricing model, extensions and introduction to pricing exotic options, credit derivatives. A strong background in mathematical statistics and partial differential equations is an advantage, but is not essential. Students completing this unit have been highly sought by the finance industry, which continues to need graduates with quantitative skills. Students enrolled in this unit at the Advanced level will be expected to undertake more challenging assessment tasks. The lectures in the Advanced unit are held concurrently with those of the corresponding Normal unit.

STAT3011
Stochastic Processes and Time Series

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week; ten 1 hour computer laboratories per semester. **Prerequisites:** STAT2X11 and (MATH1X03 or MATH1907 or MATH1X23 or MATH1933). **Prohibitions:** STAT3911 or STAT3903 or STAT3003 or STAT3905 or STAT3005 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Section I of this course will introduce the fundamental concepts of applied stochastic processes and Markov chains used in financial mathematics, mathematical statistics, applied mathematics and physics. Section II of the course establishes some methods of modeling and analysing situations which depend on time. Fitting ARMA models for certain time series are considered from both theoretical and practical points of view. Throughout the course we will use the S-PLUS (or R) statistical packages to give analyses and graphical displays.

STAT3911
Stochastic Processes and Time Series Adv

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lecture, one 1 hour tutorial per week, plus an extra 1 hour lecture per week on advanced material in the first half of the semester. Seven 1 hour computer laboratories (on time series) in the second half of the semester (one 1 hour class per week). **Prerequisites:** (STAT2911 or a mark of 65 or above in STAT2011) and (MATH1X03 or MATH1907 or MATH1X23 or MATH1933) **Prohibitions:** STAT3011 or STAT3905 or STAT3005 or STAT3003 or STAT3903 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is an Advanced version of STAT3011. There will be 3 lectures in common with STAT3011. In addition to STAT3011 material, theory on branching processes and Brownian bridges will be covered.

STAT3012
Applied Linear Models

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratories per week. **Prerequisites:** (DATA2002 or STAT2X12) and (MATH1X02 or MATH1014) **Prohibitions:** STAT3002 or STAT3004 or STAT3902 or STAT3912 or STAT3904 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course will introduce the fundamental concepts of analysis of data from both observational studies and experimental designs using classical linear methods, together with concepts of collection of data and design of experiments. First we will consider linear models and regression methods with diagnostics for checking appropriateness of models. We will look briefly at robust regression methods here. Then we will consider the design and analysis of experiments considering notions of replication, randomization and ideas of factorial designs. Throughout the course we will use the R statistical package to give analyses and graphical displays.

STAT3912
Applied Linear Models (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002)] and (MATH2X61 or MATH1902 or MATH2X22) **Prohibitions:** STAT3012 or STAT3002 or STAT3902 or STAT3004 or STAT3904 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an Advanced version of STAT3012, with emphasis on the mathematical techniques underlying applied linear models together with proofs of distribution theory based on vector space methods. There will be 3 lectures per week in common with STAT3012 and some advanced material given in a separate advanced tutorial together with more advanced assessment work.

Senior elective units of study

STAT3013
Statistical Inference

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** STAT2X11 and (DATA2002 or STAT2X12) **Prohibitions:** STAT3913 or STAT3001 or STAT3901 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this course we will study basic topics in modern statistical inference. This will include traditional concepts of mathematical statistics: likelihood estimation, method of moments, properties of estimators, exponential families, decision-theory approach to hypothesis testing, likelihood ratio test as well as more recent approaches such as Bayes estimation, Empirical Bayes and nonparametric estimation. During the computer classes (using R software package) we will illustrate the various estimation techniques and give an introduction to computationally intensive methods like Monte Carlo, Gibbs sampling and EM-algorithm.

STAT3913
Statistical Inference Advanced

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** STAT2911 and (DATA2002 or STAT2X12) **Prohibitions:** STAT3013 or STAT3901 or STAT3001 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:**

Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an Advanced version of STAT3013, with emphasis on the mathematical techniques underlying statistical inference together with proofs based on distribution theory. There will be 3 lectures per week in common with some material required only in this advanced course and some advanced material given in a separate advanced tutorial together with more advanced assessment work.

STAT3014
Applied Statistics

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** DATA2002 or STAT2X12 **Prohibitions:** STAT3914 or STAT3002 or STAT3902 or STAT3006 **Assumed knowledge:** STAT3012 or STAT3912 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has three distinct but related components: Multivariate analysis; sampling and surveys; and generalised linear models. The first component deals with multivariate data covering simple data reduction techniques like principal components analysis and core multivariate tests including Hotelling's T^2, Mahalanobis' distance and Multivariate Analysis of Variance (MANOVA). The sampling section includes sampling without replacement, stratified sampling, ratio estimation, and cluster sampling. The final section looks at the analysis of categorical data via generalized linear models. Logistic regression and log-linear models will be looked at in some detail along with special techniques for analyzing discrete data with special structure.

STAT3914
Applied Statistics Advanced

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour computer laboratory per week plus an extra hour each week which will alternate between lectures and tutorials. **Prerequisites:** STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002) **Prohibitions:** STAT3014 or STAT3907 or STAT3902 or STAT3006 or STAT3002 **Assumed knowledge:** STAT3912 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an Advanced version of STAT3014. There will be 3 lectures per week in common with STAT3014. The unit will have extra lectures focusing on multivariate distribution theory developing results for the multivariate normal, partial correlation, the Wishart distribution and Hotelling's T^2. There will also be more advanced tutorial and assessment work associated with this unit.

MATH3076
Mathematical Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour laboratory per week. **Prerequisites:** 12 credit points of MATH2XXX and 6 credit points from (MATH1021 or MATH1001 or MATH1023 or MATH1003 or MATH19X1 or MATH19X3 or MATH1906 or MATH1907) **Prohibitions:** MATH3976 or MATH3016 or MATH3916 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to Fortran 95/2003 programming and numerical methods. Topics covered include computer arithmetic and computational errors, systems of linear equations, interpolation and approximation, solution of nonlinear equations, quadrature, initial value problems for ordinary differential equations and boundary value problems.

MATH3976
Mathematical Computing (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of MATH2XXX and [6 credit points from (MATH1923 or MATH1903 or MATH1933 or MATH1907), or a mark of 65 or above in (MATH1023 or MATH1003)] **Prohibitions:** MATH3076 or MATH3016 or MATH3916 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

See entry for MATH3076 Mathematical Computing.

MATH3078
PDEs and Waves

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3018 or MATH3921 or MATH3978 **Assumed knowledge:** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **Assessment:** One 2 hour exam, assignments, quizzes (100%). To pass MATH3078/3978, students must achieve satisfactory performance in the in-semester assessment component. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces Sturm-Liouville eigenvalue problems and their role in finding solutions to boundary value problems. Analytical solutions of linear PDEs are found using separation of variables and integral transform methods. Three of the most important equations of mathematical physics - the wave equation, the diffusion (heat) equation and Laplace's equation - are treated, together with a range of applications. There is particular emphasis on wave phenomena, with an introduction to the theory of sound waves and water waves.

To pass MATH3078, students must achieve satisfactory performance in the in-semester assessment component in order to pass the unit of study.

MATH3978
PDEs and Waves (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3078 or MATH3018 or MATH3921 **Assumed knowledge:** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **Assessment:** One 2 hour exam, assignments, quizzes (100%). To pass MATH3078 or MATH3978, students must achieve satisfactory performance in the in-semester assessment component. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

As for MATH3078 PDEs and Waves but with more advanced problem solving and assessment tasks. Some additional topics may be included.

MATH3969
Measure Theory and Fourier Analysis (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorials per week. **Prerequisites:** Credit average or greater in 12 credit points Intermediate Mathematics **Prohibitions:** MATH3909 **Assumed knowledge:** At least 6 credit points of (Intermediate Advanced Mathematics or Senior Advanced Mathematics units) **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Measure theory is the study of such fundamental ideas as length, area, volume, arc length and surface area. It is the basis for the integration theory used in advanced mathematics since it was developed by Henri Lebesgue in about 1900. Moreover, it is the basis for modern probability theory. The course starts by setting up measure theory and integration, establishing important results such as Fubini's Theorem and the Dominated Convergence Theorem which allow us to manipulate integrals. This is then applied to Fourier Analysis, and results such as the Inversion Formula and Plancherel's Theorem are derived. The Radon-Nikodyn Theorem provides a representation of measures in terms of a density. Probability theory is then discussed with topics including distributions and conditional expectation.

MATH3974
Fluid Dynamics (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3914 **Assumed knowledge:** [MATH2961 and MATH2965] or [MATH2921 and MATH2922] **Assessment:** One 2 hour exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to fluid dynamics, starting with a description of the governing equations and the simplifications gained by using stream functions or potentials. It develops elementary theorems and tools, including Bernoulli's equation, the role of vorticity, the vorticity equation, Kelvin's circulation theorem, Helmholtz's theorem, and an introduction to the use of tensors. Topics covered include viscous flows, lubrication theory, boundary layers, potential theory, and complex variable methods for 2-D airfoils. The unit concludes with an introduction to hydrodynamic stability theory and the transition to turbulent flow.

DATA3404
Data Science Platforms

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** DATA2001 OR ISYS2120 OR INFO2120 OR INFO2820 **Prohibitions:** INFO3504 OR INFO3404 **Assumed knowledge:** This unit of study assumes that students have previous knowledge of database structures and of SQL. The prerequisite material is covered in DATA2001 or ISYS2120. Familiarity with a programming language (e.g. Java or C) is also expected. **Assessment:** through semester assessment (40%), final exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a comprehensive overview of the internal mechanisms data science platforms and of systems that manage large data collections. These skills are needed for successful performance tuning and to understand the scalability challenges faced by when processing Big Data. This unit builds upon the second' year DATA2001 - 'Data Science - Big Data and Data Diversity' and correspondingly assumes a sound understanding of SQL and data analysis tasks.

The first part of this subject focuses on mechanisms for large-scale data management. It provides a deep understanding of the internal components of a data management platform. Topics include: physical data organization and disk-based index structures, query processing and optimisation, and database tuning.

The second part focuses on the large-scale management of big data in a distributed architecture. Topics include: distributed and replicated databases, information retrieval, data stream processing, and web-scale data processing.

The unit will be of interest to students seeking an introduction to data management tuning, disk-based data structures and algorithms, and information retrieval. It will be valuable to those pursuing such careers as Software Engineers, Data Engineers, Database Administrators, and Big Data Platform specialists.

Table 1: Geography

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Geography			
For a major in Geography, the minimum requirement is 24 credit points from senior units of study comprising: (i) GEOS3333/3933, and (ii) any of GEOS3520/3920, GEOS3524/3924, GEOS3009/3909, GEOS3014/3914, GEOS3103/3803 and GEOS3053/3953			
Junior units of study			
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
GEOS1901 **Earth, Environment and Society Advanced**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 *Note: Department permission required for enrolment*	Semester 1
GEOS1002 **Introductory Geography**	6	**N** GEOS1902 or GEOG1001 or GEOG1002	Semester 2
GEOS1902 **Introductory Geography (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1002 or GEOG1001 or GEOG1002 *Note: Department permission required for enrolment*	Semester 2
Intermediate units of study			
GEOS2111 **Natural Hazards: a GIS Approach**	6	**P** 6 credit points of Junior Geosciences units **N** GEOS2911 *Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.*	Semester 1
GEOS2911 **Natural Hazards: A GIS Approach (Adv)**	6	**P** A mark of 75 in a 6 credit point Junior Geosciences unit of study **N** GEOS2111 *Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.*	Semester 1
GEOS2115 **Oceans, Coasts and Climate Change**	6	**A** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **P** 24 credit points from Junior Units of Study **N** GEOS2915 or MARS2006	Intensive July Semester 1
GEOS2915 **Oceans, Coasts and Climate Change (Adv)**	6	**A** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **P** Distinction average in 48 credit points from Junior units of study. **N** GEOS2115 or MARS2006	Semester 1
GEOS2121 **Environmental and Resource Management**	6	**P** 6 credit points of first year Geosciences units or ECOP1001 or ECOP1002 **N** GEOS2921	Semester 2
GEOS2921 **Environmental and Resource Management (Adv)**	6	**P** A mark of 75 in a 6 credit point Junior Geosciences unit of study or a mark of 75 in ECOP1001 or ECOP1002 **N** GEOS2121	Semester 2
GEOS2123 **The Geography of Cities and Regions**	6	**P** 6 credit points of first year Geosciences units. **N** GEOS2923	Semester 1
GEOS2923 **The Geography of Cities and Regions (Adv)**	6	**P** A mark of 75 or above in 6 credit points of first year Geosciences units. **N** GEOS2123	Semester 1
GEOS2116 **Earth Surface Processes**	6	**N** GEOS2916 or GEOG2321	Semester 2
GEOS2916 **Earth Surface Processes (Advanced)**	6	**P** Annual average mark of at least 70 **N** GEOS2116 or GEOG2321	Semester 2
Senior core units of study			
Students must complete at least one of the following core units of study:			
GEOS3333 **Geographical Concepts, Skills and Methods**	6	**A** Basic knowledge of ARC GIS software. **P** 24 credit points of Intermediate units of study, including 6 credit points from following (GEOS2112 or GEOS2912 or GEOS2123 or GEOS2923 or GEOS2115 or GEOS2915 or GEOS2121 or GEOS2921 or SOIL2002 or LWSC2002) **N** GEOS3933	Semester 2
GEOS3933 **Geog. Concepts, Skills and Methods (Adv)**	6	**A** Basic knowledge of ARC GIS software. **P** Distinction average in 24 credit points of Intermediate units of study including 6 credit points from one of the following units: GEOS2112, GEOS2912, GEOS2123, GEOS2923, GEOS2115, GEOS2915, GEOS2121, GEOS2921, SOIL2002, LWSC2002. **N** GEOS3333	Semester 2
Senior elective units of study			
GEOS3009 **Coastal Environments and Processes**	6	**P** (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics or Mathematics or Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **N** GEOS3909 or MARS3003 or MARS3105	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
GEOS3909 **Coastal Environments and Processes (Adv)**	6	**P** Distinction average in (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics, Mathematics, Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **N** GEOS3009 or MARS3003 or MARS3105 *A distinction average in prior Geography or Geology units is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.*	Semester 1
GEOS3014 **GIS in Coastal Management**	6	**P** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **N** GEOS3914 or MARS3104	Semester 2
GEOS3914 **GIS in Coastal Management (Advanced)**	6	**P** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **N** GEOS3014 or MARS3104 *Note: Department permission required for enrolment* *A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.*	Semester 2
GEOS3103 **Environmental and Sedimentary Geology**	6	**A** (GEOS1003 or GEOS1903) **P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3803	Semester 2
GEOS3803 **Environmental and Sedimentary Geology(Adv)**	6	**A** (GEOS1003 or GEOS1903) **P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3103 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 2
GEOS3520 **Urban Citizenship and Sustainability**	6	**P** 24 credit points of Intermediate units of study, including 6 credit points from the following (GEOS2112 or GEOS2912 or GEOS2123 or GEOS2923 or GEOS2115 or GEOS2915 or GEOS2121 or GEOS2921 or SOILS2002 or LWSC2002) **N** GEOS3920	Semester 1
GEOS3920 **Urban Citizenship and Sustainability (Adv)**	6	**P** Distinction average in 24 credit points of Intermediate units of study including 6 credit points from one of the following units: GEOS2112, GEOS2912, GEOS2123, GEOS2923, GEOS2115, GEOS2915, GEOS2121, GEOS2921, SOIL2002, LWSC2002 **N** GEOS3520	Semester 1
GEOS3524 **Global Development and Livelihoods**	6	**P** 24 credit points of Intermediate units of study including 6 credit points of Intermediate Geoscience **N** GEOS3924 or GEOS2112 or GEOS2912	Semester 1
GEOS3924 **Global Development and Livelihoods (Adv)**	6	**P** 24 credit points of Intermediate units of study, including a distinction in 6 credit points of Intermediate Geoscience **N** GEOS3524 or GEOS2112 or GEOS2912	Semester 1
GEOS3053 **Southeast Asia Field School**	6	**P** 6 credit points of Intermediate units of study in Geography. **N** GEOG3201 or GEOS3953 *Note: Department permission required for enrolment* *Students must contact the unit coordinator no later than September in the year before taking this unit.*	Intensive July
GEOS3953 **Southeast Asia Field School (Adv)**	6	**P** 6 credit points of Intermediate units of study in Geography. **N** GEOS3053 *Note: Department permission required for enrolment* *Students must contact the unit coordinator no later than September in the year before taking this unit.*	Intensive July

Geography

For a major in Geography, the minimum requirement is 24 credit points from senior units of study comprising:(i) GEOS3333/3933, and(ii) any of GEOS3520/3920, GEOS3524/3924, GEOS3009/3909, GEOS3014/3914, GEOS3103/3803 and GEOS3053/3953

Junior units of study

GEOS1001
Earth, Environment and Society

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the gateway unit of study for Human Geography, Physical Geography, Environmental Studies and Geology. Its objective is to introduce the big questions relating to the origins and current state of the planet: climate change, environment, landscape formation, and the growth of the human population. During the semester you will be introduced to knowledge, theories and debates about how the world's physical and human systems operate. The first module investigates the evolution of the planet through geological time, with a focus on major Earth systems such as plate tectonics and mantle convection and their interaction with the atmosphere, hydrosphere, biosphere and human civilisations. The second module presents Earth as an evolving and dynamic planet, investigating global environmental change, addressing climate variability and human impacts on the natural environment and the rate at which these changes occur and how they have the potential to dramatically affect the way we live. Finally, the third module, focuses on human-induced challenges to Earth's future. This part of the unit critically analyses the relationships between people and their environments, with central consideration to debates on population change, resource use and the policy contexts of climate change mitigation and adaptation.

GEOS1901
Earth, Environment and Society Advanced

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1001, but will be required to carry out more challenging practical assignments.

GEOS1002
Introductory Geography

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson, Dr Dan Penny **Session:** Semester 2 **Classes:** One 2 hour lecture per week and eight 2 hour practicals during semester. **Prohibitions:** GEOS1902 or GEOG1001 or GEOG1002 **Assessment:** One 2 hour exam, one 2000 word essay, two online quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a geographical perspective on the ways in which people interact with each other and the physical world, focussing on the processes that generate spatial variation and difference. Students will consider the development and characteristics of natural environments across the globe, and will explore how these environments both constrain, and are influenced by, humans. In the process, they will learn about the biophysical, political, economic, cultural and urban geographies that shape contemporary global society. Each of these themes will be discussed with reference to key examples, in order to understand the ways in which the various processes (both physical and human) interact. The unit of study is designed to attract and interest students who wish to pursue geography as a major within their undergraduate degree, but also has relevance to students who wish to learn how to think geographically about the contemporary world.

GEOS1902
Introductory Geography (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson, Dr Dan Penny **Session:** Semester 2 **Classes:** One 2 hour lecture per week and 8 2 hour practicals per semester, plus independent group work. **Prohibitions:** GEOS1002 or GEOG1001 or GEOG1002 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** One 2 hour exam, one 1000 word essay, two online quizzes, one practical report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1002, but will be required to carry out more challenging practical assignments.

Intermediate units of study

GEOS2111
Natural Hazards: a GIS Approach

Credit points: 6 **Teacher/Coordinator:** A/Prof Dale Dominey-Howes **Session:** Semester 1 **Classes:** Two hour lecture; two hour practical/tute/lab **Prerequisites:** 6 credit points of Junior Geosciences units **Prohibitions:** GEOS2911 **Assessment:** One 2 hour exam, three reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.

The unit provides an essential framework for understanding the environmental response to short- and long-term geologic, oceanic and atmospheric processes. This Unit of Study introduces students to a variety of natural phenomena that affect society with impact levels ranging from nuisance to disastrous. The discussion of each hazard focuses on: (1) the process mechanics, (2) hazards and risk, and (3) methods for mitigation. Geographic Information Systems (GIS) are used by scientists, planners, policy-makers and the insurance industry alike to address many issues relating to natural hazards. This Unit of Study will introduce students to the major concepts relating to GIS and provide practical experience in the application of GIS techniques to hazard mapping, risk assessment and mitigation.

Textbooks

No prescribed textbook

GEOS2911
Natural Hazards: A GIS Approach (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dale Dominey-Howes **Session:** Semester 1 **Classes:** Two hour lecture; two hour practical/tute/lab **Prerequisites:** A mark of 75 in a 6 credit point Junior Geosciences unit of study **Prohibitions:** GEOS2111 **Assessment:** One 2 hour exam, three reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Staff will organize a non-compulsory half-day weekend field excursion to explore local Sydney hazards for interested students.

This unit has the same objectives as GEOS2111 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives.

Textbooks

No set textbook

GEOS2115
Oceans, Coasts and Climate Change

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Müller, A/Prof Jody Webster, A.Prof Ana Vila-Concejo **Session:** Intensive July, Semester 1 **Classes:** Twenty-five 1 hour lectures, three 1 hour workshops, eight 2 hour practical classes. **Prerequisites:** 24 credit points from Junior Units of Study **Prohibitions:** GEOS2915 or MARS2006 **Assumed knowledge:** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **Assessment:** Lab reports (60%), one 2-hour exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces core concepts about how the formation of ocean basins and their influence on climate govern the development of coasts and continental margins. These concepts provide a framework for understanding the geographic variation of coasts, continental shelves and sediment accumulations in the deep ocean. Ocean-basin evolution is explained in terms of movements within the Earth's interior and how these movements determine the geometry of ocean basins, and their alpine counterparts, which interact with the global circulation of the ocean and atmosphere. This interaction plays a key role in marine sedimentation and controls the environmental conditions responsible for the development of coral reefs and other ecosystems. The Unit of Study systematically outlines how these factors have played out to produce, by gradual change, the coasts we see today, as well as the less familiar deposits hidden beneath the sea and coastal lands. The Unit thereby outlines how knowledge of responses to climate change in the past allow us to predict environmental responses to accelerated climate change occurring now and in the future due to the industrial greenhouse effect, but places these responses into perspective against the geological record. Overall therefore, the Unit aims to provide familiarity with fundamental phenomena central to the study of marine geoscience and environmental impacts, introduced through process-oriented explanations. The Unit of Study is structured around GIS-based practical sessions and problem-based project work, for which lectures provide the theoretical background.

Textbooks

On line reading material provided via Fisher Library

GEOS2915
Oceans, Coasts and Climate Change (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Muller **Session:** Semester 1 **Classes:** Twenty-five 1 hour lectures, three 1 hour workshops, eight 2 hour practical classes. **Prerequisites:** Distinction average in 48 credit points from Junior units of study. **Prohibitions:** GEOS2115 or MARS2006 **Assumed knowledge:** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **Assessment:** Lab reports (60%), one 2 hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as GEOS2115 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives.

Textbooks

Online reading materials are provided via Fisher Library.

GEOS2121
Environmental and Resource Management

Credit points: 6 **Teacher/Coordinator:** Dr Sophie Webber **Session:** Semester 2 **Classes:** Two hour lecture; one hour tutorial per week **Prerequisites:** 6 credit points of first year Geosciences units or ECOP1001 or ECOP1002 **Prohibitions:** GEOS2921 **Assessment:** One exam, one essay, one report, tutorial attendance (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are in the midst of an unprecedented global ecological and climatological crisis, and consequently need to transform our social, political and economic systems. This crisis Â¿ its causes, its effects, and its solutions Â¿ are geographically unevenly distributed and situated. Therefore, this unit of study uses geographical concepts to consider what has caused this global crisis, how we should think about the relations and interactions between humans and their environments, and what some strategies are for managing our environment and resources to negotiate this predicament. Using examples focused in Australia, Asia, and the Pacific region, students will learn how to integrate environmental, economic, political, social and cultural considerations and perspectives, and how to evaluate environmental and resource management policies and ideas.

GEOS2921
Environmental and Resource Management (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Sophie Webber **Session:** Semester 2 **Classes:** Two hour lecture; one hour tutorial per week **Prerequisites:** A mark of 75 in a 6 credit point Junior Geosciences unit of study or a mark of 75 in ECOP1001 or ECOP1002 **Prohibitions:** GEOS2121 **Assessment:** One exam, one essay, one report, tutorial attendance (100%) **Practical field work:** Seminar, maximum of four hours **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Advanced students will receive the same core lecture materials as for GEOS2121 but have a separate seminar and are required to complete alternative written work.

GEOS2123
The Geography of Cities and Regions

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** One hour tutorial per week **Prerequisites:** 6 credit points of first year Geosciences units. **Prohibitions:** GEOS2923 **Assessment:** Written reports (20%), exam (40%), field report (20%), GIS project (20%) **Practical field work:** Two hours on average, including fieldtrips within Sydney **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

How can we understand the ways that cities and regions change over time, and how these processes shape people's lives? This Unit of Study provides conceptual and practical material for exploring these questions. A program of lectures and tutorials in complemented by close study of Sydney, using GIS (census and satellite imagery) and a series of walking tours to different parts of the city. Assessment is tailored to projects in which students are required to integrate conceptual ideas about cities and regions with GIS mapping and field observations.

GEOS2923
The Geography of Cities and Regions (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** Two hour lecture; one hour tutorial per week **Prerequisites:** A mark of 75 or above in 6 credit points of first year Geosciences units. **Prohibitions:** GEOS2123 **Assessment:** Written reports (20%), exam (40%), field report (20%), GIS project (20%) **Practical field work:** Two hours on average, including fieldtrips within Sydney **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS2923 has the same thematic content as GEOS2123 however with elements taught at an Advanced level.

GEOS2116
Earth Surface Processes

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x3-hr practical (lab/computer) sessions each week **Prohibitions:** GEOS2916 or GEOG2321 **Assessment:** practical and field assignments, final exam **Practical field work:** 3-5 day field trip **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The surface of the planet on which you live is the product of a balance between tectonic forces and numerous agents of erosion. The landscapes in which you live and work, and from which you draw resources, are therefore the legacy of many processes operating synchronously over long time periods. It is also true that Earth's landscapes are dynamic, and constantly changing around you in response to climate, tectonics and patterns of life. The sustainable management of landscapes is strongly dependent upon an awareness of those processes and the ways that they constrain human-environment interactions. In Earth Surface Processes, you will learn how landscapes are produced, and what this means for contemporary land use. Lectures by experts in physical geography, geology, soil science and environmental science will introduce you to the planetary and regional-scale controls on landforms and landscape dynamics, and the nature and distribution of major Australian landscape types. Focussed around 'hands on' field and laboratory-based tasks, students will gain essential practical, analytical and interpretive skills in the analysis of landscapes and earth surface processes that shape them. This is a unit for anyone wanting to better understand the planet on which they live.

Textbooks

Allen, P.A., 2009. Earth surface processes. John Wiley and Sons. Scitech, 551.3 72 Sharma, V.K., 2010. Introduction to process geomorphology. CRC Press. Scitech, 551.41 113

GEOS2916
Earth Surface Processes (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x3-hr practical (lab/computer) sessions each week **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GEOS2116 or GEOG2321 **Assessment:** practical and research assignments, final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The surface of the planet on which you live is the product of a balance between tectonic forces and numerous agents of erosion. The landscapes in which you live and work, and from which you draw resources, are therefore the legacy of many processes operating synchronously over long time periods. It is also true that Earth's landscapes are dynamic, and constantly changing around you in response to climate, tectonics and patterns of life. The sustainable management of landscapes is strongly dependent upon an awareness of those processes and the ways that they constrain human-environment interactions. In the Advanced mode of Earth Surface Processes, you will learn how landscapes are produced, and what this means for contemporary land use. Lectures by experts in physical geography, geology, soil science and environmental science will introduce you to the planetary and regional-scale controls on landforms and landscape dynamics, and the nature and distribution of major Australian landscape types. Focussed around 'hands on' field and laboratory-based tasks, students will gain essential practical, analytical and interpretive skills in the analysis of landscapes and earth surface processes that shape them. The Advanced mode of Earth Surface Processes challenges you to create new knowledge, and provides a higher level of academic rigour. You will take part in a series of small-group practical exercises that will develop your skills in research design and execution, and will provide you with a greater depth of understanding in core aspects of geomorphology. The Advanced mode will culminate in a research-focussed Advanced Assignment. This is a unit for anyone wanting to better understand the planet on which they live, and who may wish to develop higher-level analytical and research skills in geomorphology and landscape analysis.

Textbooks

Allen, P.A., 2009. Earth surface processes. John Wiley and Sons. Scitech, 551.3 72 Sharma, V.K., 2010. Introduction to process geomorphology. CRC Press. Scitech, 551.41 113

Senior core units of study

Students must complete at least one of the following core units of study:

GEOS3333
Geographical Concepts, Skills and Methods

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard **Session:** Semester 2 **Classes:** 2 hour lecture, 1 hour tutorials per week **Prerequisites:** 24 credit points of Intermediate units of study, including 6 credit points from following (GEOS2112 or GEOS2912 or GEOS2123 or GEOS2923 or GEOS2115 or GEOS2915 or GEOS2121 or GEOS2921 or SOIL2002 or LWSC2002) **Prohibitions:** GEOS3933 **Assumed knowledge:** Basic knowledge of ARC GIS software. **Assessment:** Two 1 hr in-class exams (50%), active participation in fieldwork and classes (25%), one 2000w fieldwork report (25%) **Practical field work:** Approximately 13 hours of fieldwork per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS3333 is designed to be the 'capstone' for a Major in Geography. Its aim is to bring together the core concepts within the discipline; connect these to methodological practices, and further develop the field-based skills associated with geographical research. Reflecting the straddle of the discipline across the natural and social sciences, this unit draws on a wide diversity of material to impart key insights about the essential qualities of 'doing Geography'. This includes (i) a weekly lecture program which addresses three thematic concerns of Geography (human-environment interactions; spatial relations; and politics, policy and practice) using examples from the natural and social science perspectives at global, national and local scales; (ii) a two-hour prac class each week which introduces key methods (relevant to both the natural and social science parts of the discipline) and which leads to a major research proposal exercise; and (iii) 24 hours fieldwork through the semester, which can take the form either of a three-day field trip to rural NSW or three separate day-trips within Sydney. GEOS3333 is one of two compulsory units for the Geography Major (the other is GEOS3053) and is highly recommended for students contemplating Honours in Geography.

GEOS3933
Geog. Concepts, Skills and Methods (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard **Session:** Semester 2 **Classes:** 1 lecture, 2 tutorials per week **Prerequisites:** Distinction average in 24 credit points of Intermediate units of study including 6 credit points from one of the following units: GEOS2112, GEOS2912, GEOS2123, GEOS2923, GEOS2115, GEOS2915, GEOS2121, GEOS2921, SOIL2002, LWSC2002. **Prohibitions:** GEOS3333 **Assumed knowledge:** Basic knowledge of ARC GIS software. **Assessment:** One 2hr exam, one practical report, one 2000w fieldwork report (100%) **Practical field work:** 24 hours of fieldwork per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS3933 has the same thematic content as GEOS3333 however with elements taught at an Advanced level.

Senior elective units of study

GEOS3009
Coastal Environments and Processes

Credit points: 6 **Teacher/Coordinator:** A/Prof Jody Webster, A/Prof Ana Vila-Concejo, Dr Tristan Salles **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week; weekend excursion. **Prerequisites:** (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics or Mathematics or Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **Prohibitions:** GEOS3909 or MARS3003 or MARS3105 **Assessment:** One 2 hour exam, research reports and an online quiz (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this course is to introduce students to a variety of Coastal Environments and the major processes which control the morphodynamic evolution of these systems. The course offers a unique opportunity of learning the full spectrum of marine sedimentary environments from siliciclastic, temperate, highly urbanised and impacted estuarine ecosytems to carbonate, tropical, pristine and undeveloped/protected coastal and continental margin environments. The course is divided in three sections: Section A covers the basic morphodynamics and processes impacting carbonate-dominated coastal and continental margin environments. The focus is on carbonate reefal and margin systems and their geologic and biologic responses to past, present and future environmental changes; Section B covers the basic morphodynamics of temperate and tropical coasts, including beach morphodynamics and basic knowledge on waves and currents; Section C consolidates all concepts learnt in the previous sections by applying them to numerical modelling.

There is a compulsory weekend fieldtrip to the NSW coast to study beach morphodynamics and fieldwork techniques. Depending on the year, there may be a voluntary fieldtrip to a coral reef environment, for example, The University of Sydney One Tree Island Research Station.

Textbooks

List of selected readings provided online.

GEOS3909
Coastal Environments and Processes (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Jody Webster **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week; weekend excursion **Prerequisites:** Distinction average in (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics, Mathematics, Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **Prohibitions:** GEOS3009 or MARS3003 or MARS3105 **Assessment:** One 2 hour exam, research reports and an online quiz (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A distinction average in prior Geography or Geology units is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3009 but will carry out more challenging projects, practicals, assignments and tutorials.

GEOS3014
GIS in Coastal Management

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** 2x1 hour lectures and 1x3h practical/week **Prerequisites:** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **Prohibitions:** GEOS3914 or MARS3104 **Assessment:** One 2 hour exam, two project reports, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Coastal Management is about how scientific knowledge is used to support policy formulation and planning decisions in coastal environments. The course links coastal science to policy and practice in management of estuaries, beaches and the coastal ocean. The principles are exemplified through specific issues, such as coastal erosion, pollution, and impacts of climate-change. The issues are dealt with in terms of how things work in nature, and how the issues are handled through administrative mechanisms. These mechanisms involve planning strategies like Marine Protected Areas and setback limits on civil development in the coastal zone. The coastal environments and processes that are more relevant to coastal management including: rocky coasts; beaches, barriers and dunes; and coral reefs will also be introduced. At a practical level, the link between science and coastal management is given substance through development and use of 'decision-support models'. These models involve geocomputing methods that entail application of simulation models, remotely sensed information, and Geographic Information Systems (GIS). The course therefore includes both principles and experience in use of these methods to address coastal-management issues. (It thus also involves extensive use of computers.) Although the focus is on the coast, the principles and methods have broader relevance to environmental management in particular, and to problem-solving in general. That is, the course has vocational relevance in examining how science can be exploited to the benefit of society and nature conservation.

GEOS3914
GIS in Coastal Management (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** Two hours of lectures, one 3 hour practical per week comprising one 1 hour practical demonstration and one 2 hour practical **Prerequisites:** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **Prohibitions:** GEOS3014 or MARS3104

Assessment: One 2 hour exam, project work, two practical-based project reports, fortnightly progress quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3014 but will carry out more challenging projects, practicals, assignments and tutorials.

GEOS3103
Environmental and Sedimentary Geology

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3803 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical reports and quizes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Sediments and sedimentary rocks cover most of the Earth's surface, record much of the Earth's geological and climatic history and host important resources such as petroleum, coal, water and mineral ores. The aim of this unit is to provide students with the skills required to examine, describe and interpret sediments and sedimentary rocks for a variety of different purposes. Specific foci of the unit will be the identification of the recent or ancient environment in which sedimentary materials were deposited, the environmental controls which produce sedimentary structures, and the processes that control the production, movement and storage of sediment bodies. On completion of this unit students will be familiar with the natural processes that produce and modify sediments across a range of environments at the Earth's surface, including fluvial, aeolian, lacustrine, marginal marine and deep marine environments. The various controls on the sedimentary record such as climate and sea-level change, as well as diagenesis and geochemical cycles will also be discussed. Practical exercises will require students to examine global datasets, and determine the properties and significance of sediments and sedimentary rocks. The course is relevant to students interested in petroleum or mineral exploration, environmental and engineering geology as well as marine geoscience.

Textbooks

Course notes will be available from the Copy Centre and an appropriate set of reference texts will be placed on special reserve in the library.

GEOS3803
Environmental and Sedimentary Geology(Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3103 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical, field reports and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3103 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Textbooks

Course notes will be available from the Copy Centre and appropriate set of reference texts will be placed on special reserve in the library.

GEOS3520
Urban Citizenship and Sustainability

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** 2 hour lecture and 1 hour tutorial per week, six 2 hours practical sessions. **Prerequisites:** 24 credit points of Intermediate units of study, including 6 credit points from the following (GEOS2112 or GEOS2912 or GEOS2123 or GEOS2923 or GEOS2115 or GEOS2915 or GEOS2121 or GEOS2921 or SOILS2002 or LWSC2002) **Prohibitions:** GEOS3920 **Assessment:** One 2hr exam, one 2000w essay, one 2000w group-based prac report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cities are now the predominant home for humanity. More than half of the world's population reside in cities. The contemporary growth of cities, however, is attached to profound political questions about what it means to be urban, and what 'being urban' means for the planet. This Unit of Study provides grounding to these crucial questions. In the first half of the semester, lectures address the question: are cities sustainable? Why or why not? And for whom? This focus addresses utopian visions for cities, urban history, ecological footprint analysis, bioregionalism, transport options, urban form and urban policy, with reference to sustainable futures and the role of custodianship. During the second half of the semester, lectures address the question: what does it mean to be a 'citizen', and what has this got to do with cities and different approaches to urban sustainability? This includes consideration of historical and contemporary configurations of citizenship. Case studies illustrate ways in which new forms of citizenship are produced through struggles over rights to the city and the urban environment. Through the semester a practicals program enables students to develop urban-based research projects.

GEOS3920
Urban Citizenship and Sustainability (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kurt Iveson **Session:** Semester 1 **Classes:** 2 hour lecture and 2 hour tutorial per week **Prerequisites:** Distinction average in 24 credit points of Intermediate units of study including 6 credit points from one of the following units: GEOS2112, GEOS2912, GEOS2123, GEOS2923, GEOS2115, GEOS2915, GEOS2121, GEOS2921, SOIL2002, LWSC2002 **Prohibitions:** GEOS3520 **Assessment:** One 2hr exam, one 2000w essay, one 2000w group-based prac report. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS3920 has the same thematic content as GEOS3520 however with elements taught at an Advanced level

GEOS3524
Global Development and Livelihoods

Credit points: 6 **Teacher/Coordinator:** Dr Jeff Neilson **Session:** Semester 1 **Classes:** 2 lectures, 1 tutorial per week **Prerequisites:** 24 credit points of Intermediate units of study including 6 credit points of Intermediate Geoscience **Prohibitions:** GEOS3924 or GEOS2112 or GEOS2912 **Assessment:** Two 1hr exams, one 2000w essay, Tutorial participation, Discussion papers (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides students with grounding in core theories and frameworks used in Geography to account for the social, spatial and economic unevenness in global development. During the first half of the semester, we focus on questions relating to who are the winners and losers from contemporary patterns of global economic change. This includes the analysis of relevant conceptual approaches to understand processes of global development and inequality (including comparative advantage, global value chain theory, developmentalism, structuralism, neo-liberalism, and post-development). Then, in the second half of the semester, we adopt a livelihoods approach to better understand these broader processes from the perspective of individuals, households and communities. In general, issues are tailored to themes being played out in Asia-Pacific countries. Students are expected to participate in a variety of practical class exercises throughout the semester. This unit provides a feeder-unit into the Southeast Asia Field School.

GEOS3924
Global Development and Livelihoods (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Jeff Neilson **Session:** Semester 1 **Classes:** 2 lectures, 1 tutorial per week **Prerequisites:** 24 credit points of Intermediate units of study, including a distinction in 6 credit points of Intermediate Geoscience **Prohibitions:** GEOS3524 or GEOS2112 or GEOS2912 **Assessment:** Two 1hr exams, one 2000w essay, Tutorial participation, Discussion papers (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

GEOS3924 has the same thematic content as GEOS3524 however with elements taught at an Advanced level.

GEOS3053
Southeast Asia Field School

Credit points: 6 **Teacher/Coordinator:** Dr Jeff Neilson **Session:** Intensive July **Classes:** 3 pre-departure classes during Semester 1, up to three weeks in-country intensive involving lectures, fieldwork and field-based methods training, readings and small group discussions **Prerequisites:** 6 credit points of Intermediate units of study in Geography. **Prohibitions:** GEOG3201 or GEOS3953 **Assessment:** Group participation, one consolidation report, one exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Students must contact the unit coordinator no later than September in the year before taking this unit.

The unit of study can be taken only with prior permission from the unit of study coordinator. It constitutes a Field School run over a two to three week period in July, prior to the commencement of the second semester. In 2016, the Field School will be held in Indonesia. In other years it may be held in mainland Southeast Asia. The Field School focuses on three main themes; rural social, environmental and economic change; regional economic integration and its local effects; regional environmental change and natural resources governance. The Field School is run in close association with local universities, whose staff and students participate in some components of the course. Places are limited, and students interested in the 2016 Field School should indicate expression of interest to Dr Jeff Neilson by 26th September 2015.

GEOS3953
Southeast Asia Field School (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Jeff Neilson **Session:** Intensive July **Classes:** 3 pre-departure classes during Semester 1, up to three weeks in-country intensive involving lectures, fieldwork and field-based methods training, readings and small group discussions **Prerequisites:** 6 credit points of Intermediate units of study in Geography. **Prohibitions:** GEOS3053 **Assessment:** Group participation, one consolidation report, one exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Students must contact the unit coordinator no later than September in the year before taking this unit.

The unit of study can be taken only with prior permission from the unit of study coordinator. It constitutes a Field School run over a two to three week period in July, prior to the commencement of the second semester. In 2016, the Field School will be held in Indonesia. In other years it may be held in mainland Southeast Asia. The Field School focuses on three main themes; rural social, environmental and economic change; regional economic integration and its local effects; regional environmental change and natural resources governance. The Field School is run in close association with local universities, whose staff and students participate in some components of the course. Places are limited, and students interested in the 2016 Field School should indicate expression of interest to Dr Jeff Neilson by 26th September 2015.

Table 1: Geology and Geophysics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Geology and Geophysics			
For a major in Geology and Geophysics, the minimum requirement is 24 credit points from Senior units listed in this subject area, which must include GEOS3008/3908 and GEOS3101/3801.			
Junior units of study			
GEOS1001 **Earth, Environment and Society**	6	**N** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001	Semester 1
GEOS1901 **Earth, Environment and Society Advanced**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 *Note: Department permission required for enrolment*	Semester 1
GEOS1003 **Introduction to Geology**	6	**N** GEOS1903 or GEOL1002 or GEOL1902 or GEOL1501	Semester 2 Summer Main
GEOS1903 **Introduction to Geology (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** GEOS1003 or GEOL1002 or GEOL1902 *Note: Department permission required for enrolment*	Semester 2
Intermediate units of study			
GEOS2114 **Volcanoes, Hot Rocks and Minerals**	6	**P** A minimum of one unit of study from the following (GEOG1001, GEOL1001, GEOL1002, GEOS1003, GEOS1903, ENVI1002, GEOL1902, GEOL1501), and 24 credit points of Junior Science units of study. **N** GEOL2111 or GEOL2911 or GEOS2914 *An optional volcano field study trip to New Zealand's North Island in February is available for up to 20 students. Extra costs apply. Contact with the School in the preceding November or December is advisable to secure a place on the trip.*	Semester 1
GEOS2914 **Volcanoes, Hot Rocks and Minerals Adv**	6	**P** 24 credit points of Junior Science units of study and Distinction in (GEOL1002 or GEOS1002 or ENVI1002 or GEOL1501 or GEOL1902 or GEOS1902 or GEOS1003 or GEOS1903). **N** GEOS2114 or GEOL2001 *An optional volcano field study trip to New Zealand's North Island in February is available for up to 20 students. Extra costs apply. Contact with the School is the preceding November or December is advisable to secure a place on the trip.*	Semester 1
GEOS2124 **Fossils and Tectonics**	6	**P** 24cp of 1000-level units of study, including (GEOS1003 or GEOS1903) and (GEOS2114 or GEOS2914) **N** GEOL2123 or GEOL2124 or GEOS2924	Semester 2
GEOS2924 **Fossils and Tectonics (Advanced)**	6	**P** A mark of 75 or above in [(GEOS1003 or GEOS1903) or (GEOS2114 or GEOS2914)] **N** GEOL2123 or GEOL2124 or GEOS2124	Semester 2
Senior core units of study			
Students must complete both GEOS3008/3908 and GEOS3101/3801.			
GEOS3008 **Field Geology**	6	**P** GEOS2124 or GEOS2924 **N** GEOL3103 or GEOS3908 *Note: Department permission required for enrolment*	Intensive July
GEOS3908 **Field Geology (Adv)**	6	**P** Credit or greater in (GEOS2124 or GEOS2924) **N** GEOS3008 *Note: Department permission required for enrolment*	Intensive July
GEOS3101 **Earth's Structure and Evolution**	6	**P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3801 or GEOS3003 or GEOS3903 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917	Semester 1
GEOS3801 **Earth's Structure and Evolutions (Adv)**	6	**P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3101 or GEOS3003 or GEOS3903 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 *Prerequisites: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 1
Senior elective units of study			
GEOS3102 **Global Energy and Resources**	6	**P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3802 or GEOS3003 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 or GEOS3903	Semester 1
GEOS3802 **Global Energy and Resources (Adv)**	6	**P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3102 or GEOS3003 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 or GEOS3903 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 1
GEOS3103 **Environmental and Sedimentary Geology**	6	**A** (GEOS1003 or GEOS1903) **P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3803	Semester 2
GEOS3803 **Environmental and Sedimentary Geology(Adv)**	6	**A** (GEOS1003 or GEOS1903) **P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3103 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
GEOS3104 **Geophysical Methods**	6	**P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3804 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 or GEOS3004	Semester 2
GEOS3804 **Geophysical Methods (Advanced)**	6	**P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3104 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 2

Geology and Geophysics

For a major in Geology and Geophysics, the minimum requirement is 24 credit points from Senior units listed in this subject area, which must include GEOS3008/3908 and GEOS3101/3801.

Junior units of study

GEOS1001
Earth, Environment and Society

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1901 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the gateway unit of study for Human Geography, Physical Geography, Environmental Studies and Geology. Its objective is to introduce the big questions relating to the origins and current state of the planet: climate change, environment, landscape formation, and the growth of the human population. During the semester you will be introduced to knowledge, theories and debates about how the world's physical and human systems operate. The first module investigates the evolution of the planet through geological time, with a focus on major Earth systems such as plate tectonics and mantle convection and their interaction with the atmosphere, hydrosphere, biosphere and human civilisations. The second module presents Earth as an evolving and dynamic planet, investigating global environmental change, addressing climate variability and human impacts on the natural environment and the rate at which these changes occur and how they have the potential to dramatically affect the way we live. Finally, the third module, focuses on human-induced challenges to Earth's future. This part of the unit critically analyses the relationships between people and their environments, with central consideration to debates on population change, resource use and the policy contexts of climate change mitigation and adaptation.

GEOS1901
Earth, Environment and Society Advanced

Credit points: 6 **Teacher/Coordinator:** Prof Bill Pritchard, Dr Sabin Zahirovic, Dr Eleanor Bruce, A/Prof Tom Bishop **Session:** Semester 1 **Classes:** One 2 hour lecture and one 2 hour practical per week. **Prohibitions:** GEOS1001 or GEOG1001 or GEOG1002 or GEOL1001 or GEOL1002 or GEOL1902 or ENSY1001 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** Exam (40%), 2000 word essay (25%), practical reports (15%), presentation (20%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Advanced students will complete the same core lecture material as for GEOS1001, but will be required to carry out more challenging practical assignments.

GEOS1003
Introduction to Geology

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2, Summer Main **Classes:** Two 1 hour lectures and one 3 hour practical per week **Prohibitions:** GEOS1903 or GEOL1002 or GEOL1902 or GEOL1501 **Assessment:** One 2 hour exam, quizzes, tests, practical reports, field report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit of study is to examine the chemical and physical processes involved in mineral formation, the interior of the Earth, surface features, sedimentary environments, volcanoes, and metamorphism. Lectures and laboratory sessions on mountain building processes and the formation of mineral deposits will lead to an understanding of the forces controlling the geology of our planet. Processes such as weathering, erosion and nature of sedimentary environments are related to the origin of the Australian landscape. In addition to laboratory classes there is a one-day excursion to the western Blue Mountains and Lithgow to examine geological objects in their setting.

Textbooks

The recommended text is is Christiansen, E. H., and Hamblin, W. K. (2015). Dynamic earth: An introduction to physical geology. Burlington, MA: Jones and Bartlett Learning.

GEOS1903
Introduction to Geology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour practical per week, field classes. **Prohibitions:** GEOS1003 or GEOL1002 or GEOL1902 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** One 2 hour exam, tests, quizzes, practical reports, field report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit has the same objectives as GEOS1003 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their ATAR or UAI and/or their university performance at the time of enrolment. Students that elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. This unit may be taken as part of the BSc (Advanced).

Textbooks

The recommended text is Christiansen, E. H., and Hamblin, W. K. (2015). Dynamic earth: An introduction to physical geology. Burlington, MA: Jones and Bartlett Learning.

Intermediate units of study

GEOS2114
Volcanoes, Hot Rocks and Minerals

Credit points: 6 **Teacher/Coordinator:** A/Prof Derek Wyman, A/Prof Patrice Rey **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week. **Prerequisites:** A minimum of one unit of study from the following (GEOG1001, GEOL1001, GEOL1002, GEOS1003, GEOS1903, ENVI1002, GEOL1902, GEOL1501), and 24 credit points of Junior Science units of study. **Prohibitions:** GEOL2111 or GEOL2911 or GEOS2914 **Assessment:** One 2 hour exam, practical reports, field trip report, group presentation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: An optional volcano field study trip to New Zealand's North Island in February is available for up to 20 students. Extra costs apply. Contact with the School in the preceding November or December is advisable to secure a place on the trip.

This unit of study relates plate tectonics to a) volcanoes and magma systems that create them; b) the formation of precious metal and gemstone ores; and c) an understanding of how Earth's materials (minerals, rocks, rock formations, lithospheric plates etc.) respond to stresses and the forces that deform them. Methods of analysis involve studies at the microscopic scale (performed on thin sections) and the mesoscopic scale performed on hand specimens and outcrops. The unit includes a day field trip to study an extinct volcano in NSW.

Practical work includes independent study of igneous systems, rocks and minerals employing both microscope-based techniques and computer modelling.

GEOS2914
Volcanoes, Hot Rocks and Minerals Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Derek Wyman, A/Prof Patrice Rey, Dr Nicolas Flament **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week. **Prerequisites:** 24 credit points of Junior Science units of study and Distinction in (GEOL1002 or GEOS1002 or ENVI1002 or GEOL1501 or GEOL1902 or GEOS1902 or GEOS1003 or GEOS1903). **Prohibitions:** GEOS2114 or GEOL2001 **Assessment:** One 2 hour exam, practical reports, field trip report, group presentation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: An optional volcano field study trip to New Zealand's North Island in February is available for up to 20 students. Extra costs apply. Contact with the School is the preceding November or December is advisable to secure a place on the trip.

This unit has the same objectives as GEOS2114 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students that elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. This unit may be taken as part of the BSc (Advanced).

Textbooks

No required textbook. Course notes available.

GEOS2124
Fossils and Tectonics

Credit points: 6 **Teacher/Coordinator:** A/Prof Patrice Rey (Coordinator), Dr Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures plus one 2 hour practical each week. **Prerequisites:** 24cp of 1000-level units of study, including (GEOS1003 or GEOS1903) and (GEOS2114 or GEOS2914) **Prohibitions:** GEOL2123 or GEOL2124 or GEOS2924 **Assessment:** One 2 hour exam, practical reports, field report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to convey how fossils, stratigraphic and structural data are used together to determine ages and environments and the deformation history of rock layers. It covers an introduction to historical geology and the evolution of the major fossils groups. Methods of stratigraphic age determination include litho-, bio-, chemo-, magneto-stratigraphy, as well as radiometric geochronology and the stratigraphic characteristics of the main geological time intervals. Structural methods are focused on brittle deformation in the upper crust and sediments. Students will gain familiarity with the most important fossil groups and how to identify them, and with the most important types of faults and folds. The formation of fossil fuels such as coal, oil and gas will also be covered in an earth history and resource exploration context. The simultaneous use of fossils, stratigraphy and structure to unravel the geological history of a set of exposed rock layers is demonstrated during a field excursion to Yass.

Textbooks

Class notes for the stratigraphy and fossils part will be available for purchase from The University Copy Centre.
The following textbooks will be used for the structural geology component:
- Van der Pluijm, B.A., and S. Marshak, 2004: Earth Structure: An Introduction to Structural Geology and Tectonics, 656p. W.W. Norton and Company, Inc, ISBN: 0-393-92467-X.
- Haakon Fossen, 2010. Structural Geology. 2010. Cambridge University Press, 480 p. ISBN: 9780521516648

GEOS2924
Fossils and Tectonics (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Patrice Rey (Coordinator), Dr Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures plus one 2 hour practical each week. **Prerequisites:** A mark of 75 or above in [(GEOS1003 or GEOS1903) or (GEOS2114 or GEOS2914)] **Prohibitions:** GEOL2123 or GEOL2124 or GEOS2124 **Assessment:** One 2 hour exam, practical reports, field report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as GEOS2124 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students that elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. This unit may be taken as part of the BSc (Advanced).

Textbooks

The same as for GEOS2124.

Senior core units of study

Students must complete both GEOS3008/3908 and GEOS3101/3801.

GEOS3008
Field Geology

Credit points: 6 **Teacher/Coordinator:** Prof Geoffrey Clarke **Session:** Intensive July **Classes:** 14 days of field work (weeks 1-7) **Prerequisites:** GEOS2124 or GEOS2924 **Prohibitions:** GEOL3103 or GEOS3908 **Assessment:** The field work will be assessed by written reports (up to 10 pages in total), field exercises and practical tests (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is an essential component of the Geology and Geophysics major. Students will undertake a range of exercises, including: the field mapping and the analysis of geological objects in the field, in weakly to complexly deformed sedimentary and volcanic sequences; the field investigations of mineral deposits and their relationships to host rocks; and the practical application of geophysical methods in field mapping. The field course complements other subject areas in Geology and Geophysics and will give students experience in the field identification of rocks and minerals, regional geology, stratigraphy, structure and rock relationships. The educational objectives of the excursion involve concentrated learning met in two compulsory one-day workshops and the field excursion. Due to the nature of the exercises, there are no alternatives to attending the excursion and workshops, and students must attend and satisfactorily complete all components of the unit to pass. Students will be required to pay the cost of transport and hostel-style accommodation during fieldwork, which may involve camping. All participants need be physically capable of completing day walks at remote locations in central Australia, have previously discussed with the School any personal health and safety issues that could affect their participation in remote area fieldwork, and must submit a signed student travel form that includes up-to-date emergency contact details. In addition, it expected that students will have attained competency in HLTFA311A Apply First Aid (or equivalent) through a registered training organization.

GEOS3908
Field Geology (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Geoffrey Clarke **Session:** Intensive July **Classes:** 14 days of fieldwork. **Prerequisites:** Credit or greater in (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3008 **Assessment:** Written reports and field exercises (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit has the same objectives as GEOS3008 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week prior to the field camp which is usually in the break between semester 1 and 2. This unit of study may be taken as part of the BSc (Advanced).

GEOS3101
Earth's Structure and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Patrice Rey **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week, and a 3-day excursion. **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3801 or GEOS3003 or GEOS3903 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 **Assessment:** One 2 hour exam, practical and field reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The Earth's crust and upper mantle, or lithosphere, are a consequence of dynamic and thermal processes operating since the beginning of the Archaean. This unit focuses on information and techniques that enable an understanding of these processes. The main topics presented in this unit include: the formation and evolution of oceanic and continental lithosphere; tectonic deformation, magmatism and metamorphism at plate boundaries; and the mesoscopic and microscopic analysis of igneous and metamorphic rocks. Practical classes and field exercises are designed to enable students to competently and independently identify the common crystalline rocks in hand-specimen; and to gather and interpret the structural field data which enables the determination of the structural style and deformational history presented in particular tectonic settings. The concepts and content presented in this unit are generally considered to be essential knowledge for geologists and geophysicists and provide a conceptual framework for their professional practice. Students wishing to specialise in the field and become professional geologists will normally need to expand upon the knowledge gained from this unit and either complete an honours project or progress to postgraduate coursework in this field.

GEOS3801
Earth's Structure and Evolutions (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Patrice Rey **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3101 or GEOS3003 or GEOS3903 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 **Assessment:** One 2 hour exam, practical and field reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Prerequisites: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3101 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Senior elective units of study

GEOS3102
Global Energy and Resources

Credit points: 6 **Teacher/Coordinator:** A/Prof Derek Wyman, Prof Dietmar Müller **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 2-hour tutorial/practicals per week. **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3802 or GEOS3003 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 or GEOS3903 **Assessment:** One 2-hour exam, practical and reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines the processes that form energy and mineral resources, outlines the characteristics of major fossil fuel and metal ore deposits and introduces the principles that underpin exploration strategies used to discover and develop geological resources. The unit will focus on a variety of topics including: coal; petroleum formation and migration, hydrocarbon traps and maturation; precious metal, base metal and gemstone deposit types; and exploration strategies. An integrated approach will relate tectonic processes through time to the formation of fossil fuel and mineral provinces. Practical exercises will introduce students to the techniques used to identify economically viable geological resources using a variety of exercises based on actual examples of resource exploration drawn from both the petroleum and minerals industry.

GEOS3802
Global Energy and Resources (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Derek Wyman, Prof Dietmar Müller **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3102 or GEOS3003 or GEOS3004 or GEOS3904 or GEOS3006 or GEOS3906 or GEOS3017 or GEOS3917 or GEOS3903 **Assessment:** One 2 hour exam, practical and field reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3102 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

GEOS3103
Environmental and Sedimentary Geology

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3803 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical reports and quizes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Sediments and sedimentary rocks cover most of the Earth's surface, record much of the Earth's geological and climatic history and host important resources such as petroleum, coal, water and mineral ores. The aim of this unit is to provide students with the skills required to examine, describe and interpret sediments and sedimentary rocks for a variety of different purposes. Specific foci of the unit will be the identification of the recent or ancient environment in which sedimentary materials were deposited, the environmental controls which produce sedimentary structures, and the processes that control the production, movement and storage of sediment bodies. On completion of this unit students will be familiar with the natural processes that produce and modify sediments across a range of environments at the Earth's surface, including fluvial, aeolian, lacustrine, marginal marine and deep marine environments. The various controls on the sedimentary record such as climate and sea-level change, as well as diagenesis and geochemical cycles will also be discussed. Practical exercises will require students to examine global datasets, and determine the properties and significance of sediments and sedimentary rocks. The course is relevant to students interested in petroleum or mineral exploration, environmental and engineering geology as well as marine geoscience.

Textbooks

Course notes will be available from the Copy Centre and an appropriate set of reference texts will be placed on special reserve in the library.

GEOS3803
Environmental and Sedimentary Geology(Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3103 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical, field reports and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3103 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Textbooks

Course notes will be available from the Copy Centre and appropriate set of reference texts will be placed on special reserve in the library.

GEOS3104
Geophysical Methods

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Muller (co-ordinator), A/Prof Patrice Rey, Dr Tristan Salles, Dr Gilles Brocard **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour practical class per week. **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3804 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 or GEOS3004 **Assessment:** One 2 hour exam (50%), practical work (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces the common geophysical methods used to investigate the interior and dynamics of the Earth and focuses on the techniques used for mineral and hydrocarbon exploration. On completion of this unit students will have developed a thorough understanding of the common geophysical methods utilised in industry and academia. They will be able to evaluate and critically assess most forms of geophysical data as well as actively participate in geophysical exploration. The course will provide the students with the computational skills to process different types of geophysical data and link them to simulations of Earth processes through time, especially focussing on linking deep Earth and surface processes, such as subsidence/uplift and erosion/sedimentation. The unit is aimed at students with interests in land-based and marine exploration, plate tectonics, internal earth structure/dynamics, and near-surface investigations of groundwater resources and environmental pollution. Students wishing to specialise in the field and become professional geophysicists will need to expand upon the geophysics knowledge gained from this unit and either complete an honours project or progress to postgraduate coursework in this field.

GEOS3804
Geophysical Methods (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Müller (co-ordinator), A/Prof Patrice Rey, Dr Tristan Salles, Dr Gilles Brocard **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3104 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 **Assessment:** One 2 hour exam, practical work (100%) **Practical field work:** Geophysical Field Prac (details to be announced) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3104 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independant work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Table 1: History and Philosophy of Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
History and Philosophy of Science			
For a major in History and Philosophy of Science, the minimum requirement is 24 credit points from senior units of study listed in this subject area.			
Junior units of study			
HPSC1000 **Bioethics**	6	**N** HPSC1900 *This Junior unit of study is highly recommended to Intermediate and Senior Life Sciences students.*	Intensive July Semester 1 Summer Main
HPSC1900 **Bioethics (Advanced)**	6	**A** (ATAR 90 or above) or equivalent **N** HPSC1000 *Note: Department permission required for enrolment*	Semester 1
Intermediate units of study			
HPSC2100 **The Birth of Modern Science**	6	**P** 24 credit points of Junior units of study **N** HPSC2900	Semester 1 Summer Main
HPSC2900 **The Birth of Modern Science (Advanced)**	6	**P** 24 credit points of Junior study with a Distinction average **N** HPSC2100 *Note: Department permission required for enrolment*	Semester 1
HPSC2101 **What Is This Thing Called Science?**	6	**P** 24 credit points of Junior units of study **N** HPSC2901	Semester 2 Summer Main
HPSC2901 **What Is This Thing Called Science? (Adv)**	6	**P** 24 credit points of Junior study with a Distinction average **N** HPSC2101 *Note: Department permission required for enrolment*	Semester 2
Senior units of study			
HPSC3002 **Hist and Phil of the Biomedical Sciences**	6	**P** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901)	Semester 2
HPSC3016 **The Scientific Revolution**	6	**P** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901)	Semester 2
HPSC3023 **Psychology and Psychiatry: History and Phil**	6	**A** HPSC2100 and HPSC2101 **P** (12 credit points of Intermediate HPSC units) OR (Credit or greater in an HPSC Intermediate unit) OR (12 Intermediate credit points in Psychology units)	Semester 1
HPSC3107 **Science, Ethics and Society**	6	**P** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **N** HPSC3022 or HPSC3024 or HPSC2011	Semester 1
HPSC3108 **Hist and Phil of the Physical Sciences**	6	**P** HPSC2101 or HPSC2901	Semester 1

History and Philosophy of Science

For a major in History and Philosophy of Science, the minimum requirement is 24 credit points from senior units of study listed in this subject area.

Junior units of study

HPSC1000
Bioethics

Credit points: 6 **Teacher/Coordinator:** Assoc. Professor Dominic Murphy **Session:** Intensive July, Semester 1, Summer Main **Classes:** Three 1 hour lectures and one 1 hour tutorial per week **Prohibitions:** HPSC1900 **Assessment:** 3 x 1,250 word papers and tutorial work **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This Junior unit of study is highly recommended to Intermediate and Senior Life Sciences students.

Science has given us nearly infinite possibilities for controlling life. Scientists probe the origins of life through research with stem cells and embryos. To unlock the secrets of disease, biomedicine conducts cruel experiments on animals. GM crops are presented as the answer to hunger. Organ transplantation is almost routine. The international traffic in human body parts and tissues is thriving. The concept of brain death makes harvesting organs ethically more acceptable. It may also result in fundamental changes in our ideas about life. Science has provided new ways of controlling and manipulating life and death. As a consequence, difficult ethical questions are raised in increasingly complex cultural and social environments. This course will discuss major issues in the ethics of biology and medicine, from gene modification to Dolly the sheep. This unit will be introductory, but a small number of topical issues will be studied in depth. No scientific background beyond Year 10 level will be assumed.

Textbooks
Course Reader

HPSC1900
Bioethics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Assoc. Professor Dominic Murphy **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial per week. **Prohibitions:** HPSC1000 **Assumed knowledge:** (ATAR 90 or above) or equivalent **Assessment:** 3 x 1,250 word papers and tutorial work **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The topics covered by HPSC1000 - Bioethics will be treated in more depth, in a special tutorial set aside for Advanced students.

Textbooks
Course Reader

Intermediate units of study

HPSC2100
The Birth of Modern Science

Credit points: 6 **Teacher/Coordinator:** Professor Ofer Gal **Session:** Semester 1, Summer Main **Classes:** Three 1 hour lectures, one 1 hour tutorial per week. **Prerequisites:** 24 credit points of Junior units of study **Prohibitions:** HPSC2900 **Assessment:** 4xquizzes (30%) and 6x100wd questions (30%) and 3x750wd essays (30%) and class participation (10%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Modern culture is a culture of science and modern science is the outcome of a historical process of 2,500 years. In this course we investigate how traditional knowledge gradually acquired the characteristics of 'science': the social structure, contents, values and methods we are familiar with. We will look at some primary chapters of this process, from antiquity to the end of the seventeenth century, and try to understand their implications to understanding contemporary science in its culture. Special emphasis will be given to the scientific revolution of the seventeenth century, which is often described as the most important period in the history of science and as one of the most vital stages in human intellectual history.

Textbooks

Dear, Peter: Revolutionizing the Sciences: European Knowledge and Ambitions, 1500-1700. 2nd ed. New York: Palgrave Macmillan (2009).

HPSC2900
The Birth of Modern Science (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof. Ofer Gal **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 24 credit points of Junior study with a Distinction average **Prohibitions:** HPSC2100 **Assessment:** 2x1500wd essays (45%) and 1x3000 wd essay (45%) and class presentation (10%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The topics covered in 'The Birth of Modern Science' will be covered in more depth, in a special tutorial set aside for advanced students.

Textbooks

Henry, J (2002). The Scientific Revolution and the Origins of Modern Science. Palgrave Macmillan. Course reader

HPSC2101
What Is This Thing Called Science?

Credit points: 6 **Teacher/Coordinator:** Professor Peter Godfrey-Smith **Session:** Semester 2, Summer Main **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 24 credit points of Junior units of study **Prohibitions:** HPSC2901 **Assessment:** 2x1500 wd essays (50%) and 1x3000 wd essay (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

What distinguishes creationism from evolutionary theory, or astrology from astronomy? Can we have good reason to believe that our current scientific theories represent the world "as it really is"? This course critically examines the most important attempts to describe the scientific method, to draw a line dividing science from non-science, and to justify the high status generally accorded to scientific knowledge. Views studied include Karl Popper's idea that scientific theories are falsifiable in principle, Thomas Kuhn's proposal that science consists of a series of paradigms separated by abrupt scientific revolutions, and claims by Feyerabend and others that there are no objective criteria by which science can be distinguished from pseudo-science. This unit of study also explores contemporary theories of evidence and explanation, the role of social values in science, sociological approaches to understanding science, and the nature of scientific change.

Textbooks

Godfrey-Smith, P (2003). Theory and Reality. The University of Chicago Press. USA/ Curd, Cover and Pincock (2013). Philosophy of Science: The Central Issues (2nd edition). W. W. Norton and Company.

HPSC2901
What Is This Thing Called Science? (Adv)

Credit points: 6 **Teacher/Coordinator:** Professor Peter Godfrey-Smith **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 24 credit points of Junior study with a Distinction average **Prohibitions:** HPSC2101 **Assessment:** 2x1500 wd essays (45%) and 1x3000 wd essay (45%) and class presentation (10%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The topics covered in 'What is This Thing Called Science?' will be covered in more depth, in a special tutorial set aside for advanced students.

Textbooks

Course reader

Senior units of study

HPSC3002
Hist and Phil of the Biomedical Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Daniela Helbig **Session:** Semester 2 **Classes:** Two 1 hour lectures and two 1 hour tutorials per week. **Prerequisites:** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **Assessment:** 2x300-400wd reports (25%) and 1xclass presentation (25%) and class questions (10%) and 1x2500-3000 wd essay (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Throughout the ages people have been born, have died, and in between have lived in various stages of sickness or health. In this unit of study we shall look at how these states of being were perceived in different times and places throughout history, while at the same time noting the increasing medicalisation of everyday life, together with the irony that the "miracles" of modern medicine appear to have created a generation of the "worried well". Using this historical perspective, we shall ask how perceptions of sickness, health and the related provision of health care have been intertwined with social, political and economic factors and, indeed still are today.

Textbooks

Course reader

HPSC3016
The Scientific Revolution

Credit points: 6 **Teacher/Coordinator:** Prof Ofer Gal **Session:** Semester 2 **Classes:** Two 1 hour lectures and two 1 hour tutorials per week. Individual student consultation as required. **Prerequisites:** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **Assessment:** 10x150wd questions (40%) and 1x 3500wd essay (40%) and 1 x Experiment (10%) and Class Participation (10%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Modern Western science has a number of characteristics that distinguish it from other scientific cultures. It ascribes its tremendous success to sophisticated experiments and meticulous observation. It understands the universe in terms of tiny particles in motion and the forces between them. It is characterised by high- powered mathematical theorising and the rejection of any intention, value or purpose in Nature. Many of these characteristics were shaped in the 17th century, during the so-called scientific revolution. We will consider them from an integrated historical- philosophical perspective, paying special attention to the intellectual motivations of the canonical figures of this revolution and the cultural context in which they operated. Topics will include: experimentation and instrumentation, clocks, mechanistic philosophy, and the changing role of mathematics.

Textbooks

Course reader

HPSC3023
Psychology and Psychiatry: History and Phil

Credit points: 6 **Teacher/Coordinator:** A/Prof Hans Pols and Dr Fiona Hibberd **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** (12 credit points of Intermediate HPSC units) OR (Credit or greater in an HPSC Intermediate unit) OR (12 Intermediate credit points in Psychology units) **Assumed knowledge:** HPSC2100 and HPSC2101 **Assessment:** 1x 2500wd essay (45%) and 1x2hr exam (45%) class participation (10%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Across the unit we examine one of the most interesting aspects of the history and philosophy of science. viz., the scientific practices and assumptions involved in making human beings an object of study. We will examine the ways in which psychologists and psychiatrists have investigated human nature, the kinds of experimental approaches they have developed to that end, the major controversies in this field, and the basic philosophical assumptions that have been made in the sciences of human nature. We investigate the developments of psychological theories and investigative methods as well as the development of psychiatric theory, treatment methods, and institutions.

HPSC3107
Science, Ethics and Society

Credit points: 6 **Teacher/Coordinator:** Associate Professor Hans Pols **Session:** Semester 1 **Classes:** 2 x 1-hour lectures and 2 x 1-hour tutorials/week **Prerequisites:** (HPSC2100 or HPSC2900) and (HPSC2101 or HPSC2901) **Prohibitions:** HPSC3022 or HPSC3024 or HPSC2011 **Assessment:** Two 1500-word essays (2x25%); one 3000-word essay (40%); participation (10%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this unit of study, we will use approaches from the sociology to investigate the place of science in society, the internal dynamics of science, and ethical issues within science and in relation to its application. The key idea in this course is that science is a social activity that can be studied like other forms of social phenomena and behaviour. There are three components to this Unit of Study: an exploration of the motivations of scientists and how they can be described using cognitive and ethical rules; approaches in the social studies of science; and ethical issues that have become prominent because of recent developments in science.

HPSC3108
Hist and Phil of the Physical Sciences

Credit points: 6 **Teacher/Coordinator:** Professor Dean Rickles **Session:** Semester 1 **Classes:** One 2-hour lecture and two 1-hour tutorials per week. **Prerequisites:** HPSC2101 or HPSC2901 **Assessment:** Four 1500-word essays (4x25%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study deals with a selection of contemporary debates in the history and philosophy of natural sciences. It covers four main themes: (1) the question of how evidence is gathered in the natural sciences and how it is (and/or other factors) go into confirming theories-we also consider what confirmation consists in (including an examination of Bayesianism). (2) Issues of modelling, representation, and measurement, including an analysis of the ways idealisation, approximation, and simulation are to be understood. (3) Models of scientific explanation, including recent work on laws, prediction, and causality. (4) issues of emergence and reduction, including the problems associated with defining such concepts - we also consider notions of simplicity and the impact of the sciences of complexity. The unit of study involves case studies from the natural sciences that allow students to apply their knowledge and test their understanding. Upon completion of the unit, students will have developed a range of skills that will allow them to explore the physical sciences with more critical attitude.

Textbooks
Course reader

Table 1: Immunobiology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Immunobiology			
For a major in Immunobiology, the minimum requirement is 24 credit points comprising:			
(i) IMMU3102/3902 Cellular and Molecular Immunology and IMMU3202/3903 Immunology in Human Disease; and			
(ii) a minimum of 12 credit points from the following senior elective units of study: AMED3001, AMED3002, AMED3003, AMED3004, BCHM3071/3971, BCHM3081/3981, BCHM3072/3972, BCHM3082/3982, BIOL3018/3918, BIOL3026/3926, CPAT3201, CPAT3202, MICR3011/3911, PHSI3009/3909, PHSI3010/3910, VIRO3001/3901, VIRO3002/3902			
Intermediate units of study			
IMMU2101 **Introductory Immunology**	6	**A** CHEM1XX1 **P** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **N** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.*	Semester 1
Senior core units of study			
Students must complete both IMMU3102/3902 and IMMU3202/3903.			
IMMU3102 **Molecular and Cellular Immunology**	6	**P** IMMU2101 or (BMED2401 and BMED2404) **N** IMMU3902 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3902 **Molecular and Cellular Immunology (Advanced)**	6	**P** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **N** IMMU3102 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3202 **Immunology in Human Disease**	6	**P** IMMU2101 or (BMED2401 and BMED2404) **N** IMMU3903 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
IMMU3903 **Immunology in Human Disease (Advanced)**	6	**P** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **N** IMMU3202 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
Senior elective units of study			
AMED3001 **Cancer**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
AMED3002 **Interrogating Biomedical and Health Data**	6	**A** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
AMED3003 **Diagnostics and Biomarkers**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
AMED3004 **Clinical Science**	6	*BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3071 **Molecular Biology and Biochemistry-Genes**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3971 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3971 **Molecular Biology and Biochem-Genes (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3071 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3081 **Mol Biology and Biochemistry-Proteins**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3981 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3981 **Mol Biology and Biochem-Proteins (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3081 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BCHM3072 **Human Molecular Cell Biology**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3972 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3972 **Human Molecular Cell Biology (Advanced)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3072 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3082 **Medical and Metabolic Biochemistry**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3982 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3982 **Medical and Metabolic Biochemistry (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3082	Semester 2
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1
BIOL3918 **Gene Technology and Genomics (Adv)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **N** BIOL3018	Semester 1
BIOL3026 **Developmental Genetics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **N** BIOL3926	Semester 2
BIOL3926 **Developmental Genetics (Advanced)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **N** BIOL3929 or BIOL3026	Semester 2
CPAT3201 **Pathogenesis of Human Disease 1**	6	**A** Sound knowledge of biology through meeting pre-requisites **P** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
CPAT3202 **Pathogenesis of Human Disease 2**	6	**A** Sound knowledge of biology through meeting pre-requisites **P** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) **C** CPAT3201 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3011 **Microbes in Infection**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **N** MICR3911 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
MICR3911 **Microbes in Infection (Advanced)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** MICR3011	Semester 1
PHSI3009 **Frontiers in Cellular Physiology**	6	**P** (PHSI2X05 and PHSI2X06) or (BMED2401 and an additional 12 credit points from BMED240X) **N** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3909 *We strongly recommend that students take both (PHSI3009 or PHSI3909) and (PHSI3010 or PHSI3910) units of study concurrently*	Semester 1
PHSI3909 **Frontiers in Cellular Physiology (Adv)**	6	**P** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **N** PHSI3009, PHSI3005, PHSI3905, PHSI3006, PHSI3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PHSI3010 **Reproduction, Development and Disease**	6	**P** (PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02, BIOL2X29, GEGE2X01)] or [12cp from (BMED2402, BMED2403, BMED2406)] **N** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3910 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PHSI3910 **Reproduction, Development and Disease Adv**	6	**P** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02 or BIOL2X29 or GEGE2X01)] or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **N** PHSI3010, PHSI3005, PHSI3905, PHSI3006, PHSI3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
VIRO3001 **Virology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3901 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
VIRO3901 **Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** VIRO3001 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
VIRO3002 **Medical and Applied Virology**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3902 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.*	Semester 2
VIRO3902 **Medical and Applied Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **N** VIRO3002 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.*	Semester 2

Immunobiology

For a major in Immunobiology, the minimum requirement is 24 credit points comprising:(i) IMMU3102/3902 Cellular and Molecular Immunology and IMMU3202/3903 Immunology in Human Disease; and(ii) a minimum of 12 credit points from the following senior elective units of study: AMED3001, AMED3002, AMED3003, AMED3004, BCHM3071/3971, BCHM3081/3981, BCHM3072/3972, BCHM3082/3982, BIOL3018/3918, BIOL3026/3926, CPAT3201, CPAT3202, MICR3011/3911, PHSI3009/3909, PHSI3010/3910, VIRO3001/3901, VIRO3002/3902

Intermediate units of study

IMMU2101
Introductory Immunology

Credit points: 6 **Teacher/Coordinator:** Dr Umaimainthan Palendira **Session:** Semester 1 **Classes:** Two 1 hour lectures per week, one 2-3 hour tutorial or practical per week. **Prerequisites:** BIOL1XX8 or BIOL1XX7 or BIOL1XX3 or BIOL1XX2 or MEDS1X01 or MBLG1XX1 **Prohibitions:** BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XX1 **Assessment:** Progressive assessment: includes written, practical, oral and online based assessments (50%); Formal assessment: one 2 hour examination (50%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a prerequisite unit of study for IMMU3102, IMMU3202, IMMU3902 and IMMU3903. The completion of 6 credit points of MBLG units of study is highly recommended.

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Introductory Immunology is for you. This unit of study will provide an overview of the immune system and the essential features of immune responses. You will be treated to a lecture course delivered by cutting edge immunologists that begins with a study of immunology as a basic research science. This includes an introduction to the nature of the cells and molecules involved in the immune response. We build on this foundation by introducing the immunological principles underlying the eradication of infectious diseases, successful vaccination strategies, organ transplantation, combatting autoimmune diseases and treating cancer. The integrated tutorials will build on the lecture material as well as provide you with instructions on how to successfully locate and critically analyse scientific literature. The practical sessions will further illustrate particular concepts introduced in the lecture program and provide you with valuable exposure to a variety of very important immunological techniques.

Textbooks

Abul K Abbas, Andrew H Lichtman and Shiv Pillai. Basic Immunology: Functions and Disorders of the Immune System. 5th Ed. 2016

Senior core units of study

Students must complete both IMMU3102/3902 and IMMU3202/3903.

IMMU3102
Molecular and Cellular Immunology

Credit points: 6 **Teacher/Coordinator:** A/Prof Carl Feng **Session:** Semester 2 **Classes:** Three 1 hour lectures, one tutorial and one 4-hour practical per fortnight. **Prerequisites:** IMMU2101 or (BMED2401 and BMED2404) **Prohibitions:** IMMU3902 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This study unit builds on the series of lectures that outlined the general properties of the immune system, effector lymphocytes and their functions, delivered in the core courses, IMMU2101 - Introductory Immunology and BMED2404 - Microbes, Infection and Immunity (formerly IMMU2001 and BMED2807). In this unit the molecular and cellular aspects of the immune system are investigated in detail. We emphasise fundamental concepts to provide a scientific basis for studies of the coordinated and regulated immune responses that lead to elimination of infectious organisms. Guest lectures from research scientists eminent in particular branches of immunological research are a special feature of the course. These provide challenging information from the forefront of research that will enable the student to become aware of the many components that come under the broad heading 'Immunology'. Three lectures (1 hour each) will be given each fortnight: 2 lectures in one week and one lecture the following week, for the duration of the course. This unit directly complements the unit 'Immunology in Human Disease IMMU3202' and students are very strongly advised to undertake these study units concurrently.

Textbooks

Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier.

IMMU3902
Molecular and Cellular Immunology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Carl Feng **Session:** Semester 2 **Classes:** 3 lectures, 1 special seminar/tutorial (2 hours), 1 practical (4 hours) every 2 weeks. **Prerequisites:** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **Prohibitions:** IMMU3102 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Introductory Immunology (IMMU2101). Advanced students will complete the same core lecture material as students in IMMU3102 but carry out advanced level practical work and a series of specialized seminar based tutorial classes.

Textbooks

Textbooks Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier.

IMMU3202
Immunology in Human Disease

Credit points: 6 **Teacher/Coordinator:** A/Prof Allison Abendroth **Session:** Semester 2 **Classes:** Three 1 hour lectures, one tutorial and one 4 hour practical per fortnight. **Prerequisites:** IMMU2101 or (BMED2401 and BMED2404) **Prohibitions:** IMMU3903 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This study unit builds on the series of lectures that outlined the general properties of the immune system, effector lymphocytes and their functions, delivered in the core courses, IMMU2101 - Introductory Immunology and BMED2404 - Microbes, Infection and Immunity (formerly IMMU2001 and BMED2807). We emphasise fundamental concepts to provide a scientific basis for studies in clinical immunology; dysfunctions of the immune system e.g. autoimmune disease, immunodeficiencies, and allergy, and immunity in terms of host - pathogen interactions. This unit has a strong focus on significant clinical problems in immunology and the scientific background to these problems. The unit includes lectures from research scientists and clinicians covering areas such as allergy, immunodeficiency, autoimmune disease and transplantation. This course provides challenging information from the forefront of clinical immunology and helps the student develop an understanding of immune responses in human health and disease. Three lectures (1 hour each) will be given each fortnight: 2 lectures in one week and one lecture the following week, for the duration of the course. This unit directly complements the unit 'Molecular and Cellular Immunology IMMU3102' and students are very strongly advised to undertake these study units concurrently.

Textbooks

Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier

IMMU3903
Immunology in Human Disease (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Allison Abendroth **Session:** Semester 2 **Classes:** 3 lectures,1 seminar/tutorial (2 hours) and1 practical (4 hours) every 2 weeks. **Prerequisites:** A mark of 75 or above in IMMU2101 or (BMED2401 and a mark of 75 or above in BMED2404) **Prohibitions:** IMMU3202 **Assessment:** Formal examination (one 2 hour exam) and Progressive assessment including written, practical and oral based assessments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Introductory Immunology (IMMU2101). Advanced students will complete the same core lecture material as students in IMMU3202 but carry out advanced level practical work and a series of specialized seminar based tutorial classes.

Textbooks

Abbas, AK, Lichtman, AH and Pillai, S. Cellular and Molecular Immunology 8th edition. 2015. Elsevier

Senior elective units of study

AMED3001
Cancer

Credit points: 6 **Teacher/Coordinator:** Assoc Prof Scott Byrne **Session:** Semester 1 **Classes:** interactive face to face activities 4 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, assignments, quiz, presentation **Campus:** Westmead, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

What does it mean when someone tells you: "you have cancer"? Initially you're probably consumed with questions like: "how did this happen?" and "will this cancer kill me?". In this unit, we will explore all aspects of the "cancer problem" from the underlying biomedical and environmental causes, through to emerging approaches to cancer diagnosis and treatment. You will integrate medical science knowledge from a diverse range of disciplines and apply this to the prevention, diagnosis and treatment of cancer both at the individual and community level. Together we will explore the epidemiology, aetiology and pathophysiology of cancer. You will be able to define problems and formulate solutions related to the study, prevention and treatment of cancer with consideration throughout for the economic, social and psychological costs of a disease that affects billions. Face-to-face and online learning activities will allow you to work effectively in individual and collaborative contexts. You will acquire the skills to interpret and communicate observations and experimental findings related to the "cancer problem" to diverse audiences. Upon completion, you will have developed the foundations that will allow you to follow a career in cancer research, clinical and diagnostic cancer services and/or the corporate system that supports the health care system.

Textbooks

Recommended Textbook: 1.,Weinberg (2013) The Biology of Cancer. 2nd edition. Garland Science Recommended reading: 1.,Hanahan and Weinberg (2000). The hallmarks of cancer. Cell 100, 57-70. 2.,Hanahan and Weinberg (2011). Hallmarks of cancer: the next generation. Cell 144, 646-74

AMED3002
Interrogating Biomedical and Health Data

Credit points: 6 **Teacher/Coordinator:** Prof Jean Yang **Session:** Semester 1 **Classes:** face to face 5 hrs/week; online 2 hrs/week; individual and/or group work 3-6 hrs/week **Assumed knowledge:** A Exploratory data analysis, sampling, simple linear regression, t-tests, confidence intervals and chi-squared goodness of fit tests, familiar with basic coding, basic linear algebra. Additional information for BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit. **Assessment:** in-semester exam, assignments, presentation **Campus:** Westmead, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Biotechnological advances have given rise to an explosion of original and shared public data relevant to human health. These data, including the monitoring of expression levels for thousands of genes and proteins simultaneously, together with multiple databases on biological systems, now promise exciting, ground-breaking discoveries in complex diseases. Critical to these discoveries will be our ability to unravel and extract information from these data. In this unit, you will develop analytical skills required to work with data obtained in the medical and diagnostic sciences. You will explore clinical data using powerful, state of the art methods and tools. Using real data sets, you will be guided in the application of modern data science techniques to interrogate, analyse and represent the data, both graphically and numerically. By analysing your own real data, as well as that from large public resources you will learn and apply the methods needed to find information on the relationship between genes and disease. Leveraging expertise from multiple sources by working in team-based collaborative learning environments, you will develop knowledge and skills that will enable you to play an active role in finding meaningful solutions to difficult problems, creating an important impact on our lives.

AMED3003
Diagnostics and Biomarkers

Credit points: 6 **Teacher/Coordinator:** Dr Fabienne Brilot-Turville **Session:** Semester 2 **Classes:** interactive face to face 4 hrs/week; online activities 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, skill based assessments, presentation **Campus:** Westmead, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Diagnostic sciences have evolved at a rapid pace and provide the cornerstone of our health care system. Effective diagnostic assays enable the identification of people who have, or are at risk of, a disease, and guide their treatment. Research into the pathophysiology of disease underpins the discovery of novel biomarkers and in turn, the development of revolutionary diagnostic assays that make use of state-of-the-art molecular and cellular methods. In this unit you will explore a diverse range of diagnostic tests and gain valuable practical experience in a number of core diagnostic methodologies, many of which are currently used in hospital laboratories. Together we will also cover the regulatory, social, and ethical aspects of the use of biomarkers and diagnostic tests and explore the pathways to their translation into clinical practice. By undertaking this unit, you will develop your understanding of diagnostic assays and biomarkers and acquire the skills needed to embark on a career in diagnostic sciences.

AMED3004
Clinical Science

Credit points: 6 **Teacher/Coordinator:** Dr Wendy Gold **Session:** Semester 2 **Classes:** interactive face to face 4 hrs/week; online activities 2 hrs/week; individual and/or group work 3-6 hrs/week **Assessment:** in-semester exam, skill based assessment, assignments **Campus:** Westmead, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Clinical science is a multidisciplinary science that combines the principles of experimental science with translational medicine. As a clinical scientist, you will have the capacity to interpret test results, isolate causes of disease, and ultimately develop new treatments that will save lives. Clinical Science will provide you with the breadth and depth of knowledge and skills that will give you a broad foundation of knowledge and open up a range of career opportunities in clinical sciences, including medical research, pharmaceutical development and clinical diagnostics. You will learn the language of the clinical world as you develop expertise in literature searching, study design, data interrogation and interpretation, evidence-based decision-making, and current knowledge in medical research. You will explore how discoveries in the medical sciences are translated into clinical practice, and pose your own clinical questions for investigation. You will study important medical conditions from the areas of infectious and genetic diseases and immunity. The capstone experience of your study in Clinical Science will be a short internship in a sector of the clinical sciences of your interest, such as a diagnostic lab, a research lab or a clinical trials centre.

BCHM3071
Molecular Biology and Biochemistry-Genes

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3971 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester practical work and assignments (30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3971
Molecular Biology and Biochem-Genes (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3071 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

The lecture component of this unit of study is the same as BCHM3071. Qualified students will attend seminars/practical classes in which more sophisticated topics in gene expression and manipulation will be covered.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3081
Mol Biology and Biochemistry-Proteins

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Prof Joel Mackay **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3981 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the functions of proteins in living organisms, with a focus on eukaryotic and particularly human systems. Its lecture component deals with how proteins adopt their biologically active forms, including discussions of protein structure, protein folding and how recombinant DNA technology can be used to design novel proteins with potential medical or biotechnology applications. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of proteins. It also covers physiologically and medically important aspects of proteins in living systems, including the roles of chaperones in protein folding inside cells, the pathological consequences of misfolding of proteins, how proteins are sorted to different cellular compartments and how the biological activities of proteins can be controlled by regulated protein degradation. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology and protein biochemistry laboratories.

Textbooks

Williamson M. How Proteins Work. Garland. 2012.

BCHM3981
Mol Biology and Biochem-Proteins (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Prof Joel Mackay **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3081 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the functions of proteins in living organisms, with a focus on eukaryotic and particularly human systems. Its lecture component deals with how proteins adopt their biologically active forms, including discussions of protein structure, protein folding and how recombinant DNA technology can be used to design novel proteins with potential medical or biotechnology applications. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of proteins. It also covers physiologically and medically important aspects of proteins in living systems, including the roles of chaperones in protein folding inside cells, the pathological consequences of misfolding of proteins, how proteins are sorted to different cellular compartments and how the biological activities of proteins can be controlled by regulated protein degradation. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology and protein biochemistry laboratories.

The lecture component of this unit of study is the same as BCHM3081. Qualified students will attend seminars/practical classes in which more sophisticated topics in protein biochemistry will be covered.

Textbooks

Williamson M. How Proteins Work. Garland. 2012.

BCHM3072
Human Molecular Cell Biology

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3972 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BCHM3972
Human Molecular Cell Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3072 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

The lecture component of this unit of study is the same as BCHM3072. Qualified students will attend seminars/practical classes in which more sophisticated topics in modern molecular cell biology will be covered.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BCHM3082
Medical and Metabolic Biochemistry

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3982 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Campus:**

Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with molecular biology methods and studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry.

BCHM3982
Medical and Metabolic Biochemistry (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3082 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with new methods, including magnetic resonance techniques and molecular biology methods, as well as studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry. Qualified students will attend some lectures/practical classes in common with BCHM3082 and some separate lectures/ practical classes in which more sophisticated topics in metabolic biochemistry will be covered.

BIOL3018
Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

BIOL3918
Gene Technology and Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **Prohibitions:** BIOL3018 **Assessment:** One 2-hour exam (60%), assignments (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of BIOL3018 Gene Technology and Genomics. The content and nature of these components may vary from year to year.

BIOL3026
Developmental Genetics

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **Prohibitions:** BIOL3926 **Assessment:** One 2-hour exam, assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Developmental genetics discusses major concepts and our current understanding of developmental biology with an emphasis on molecular genetics. The developmental genetics of animal and plant systems will be investigated, along with approaches used to determine gene function in relation to development of complex multicellular organisms. Topics include the features and resources for model organisms; the generation of mutants for forward and reverse genetics; the application of mutants to the study gene function and gene networks; spatial and temporal gene expression in pattern formation; quantitative trait loci analysis; utility of genome wide association studies; epigenetics in relation to inheritance; genome information in the study of human genetics. Reference will be made to the use of modern techniques in developmental biology such as transgenics, recombinant DNA technology, tissue-specific expression analysis. Various methods of genetic mapping will be covered. Practical work complements the theoretical aspects of the course and develops important skills in genetics.

BIOL3926
Developmental Genetics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **Prohibitions:** BIOL3929 or BIOL3026 **Assessment:** One 2-hour exam, assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components to BIOL3026 Developmental Genetics. The content and nature of these components may vary from year to year. Some assessment will be in an alternative format to components of BIOL3026.

CPAT3201
Pathogenesis of Human Disease 1

Credit points: 6 **Teacher/Coordinator:** A/Prof Paul Witting **Session:** Semester 2 **Classes:** Three 1-hour lectures and one 3-hour research tutorial per week. **Prerequisites:** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) **Assumed knowledge:** Sound knowledge of biology through meeting pre-requisites **Assessment:** One 2-hour exam (60%), one major research essay (1500w) (20%), two 0.5-hour in-semester exams (20%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The Pathogenesis of Human Disease 1 unit of study modules will provide a theoretical background to the scientific basis of the pathogenesis of disease. Areas covered in theoretical modules include: tissue responses to exogenous factors, adaptive responses to foreign agents, cardiovascular/pulmonary/gut responses to disease, forensic science, neuropathology and cancer. The aims of the course are: - To give students an overall understanding of the fundamental biological mechanisms governing disease pathogenesis in human beings. - To introduce to students basic concepts of the pathogenesis, natural history and complications of common human diseases. - To demonstrate and exemplify differences between normality and disease. - To explain cellular aspects of certain pathological processes. Together with CPAT3202, the unit of study would be appropriate for those who intend to proceed to Honours research, to postgraduate studies such as Medicine or to careers in biomedical areas such as hospital science. Enquires should be directed to anthea.matsimanis@sydney.edu.au

Textbooks

Kumar, Abbas and Aster. Robbins Basic Pathology, 9th edition. Saunders. 2012.

CPAT3202
Pathogenesis of Human Disease 2

Credit points: 6 **Teacher/Coordinator:** A/Prof Paul Witting **Session:** Semester 2 **Classes:** Practical Module **Prerequisites:** [12cp from (ANAT2XXX or BCHM2XXX or BCMB2X0X or BIOL2XXX or GEGE2X01 or IMMU2101 or MBLG2XXX or MICR2XXX or PCOL201X or PHSI2XXX)] or (BMED2403 and BMED2404) **Corequisites:** CPAT3201 **Assumed knowledge:** Sound knowledge of biology through meeting pre-requisites **Assessment:** One 2-hour exam (60%), Museum Practical Reports (40%). **Practical field work:** One 2-hour microscopic practical and one 2-hour museum practical per week. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The Pathogenesis of Human Disease 2 unit of study modules will provide a practical background to the scientific basis of the pathogenesis of disease. Areas covered in practical modules include disease specimen evaluation on a macroscopic and microscopic basis. The aims of the course are: - To enable students to gain an understanding of how different organ systems react to injury and to apply basic concepts of disease processes. - To equip students with skills appropriate for careers in the biomedical sciences and for further training in research or professional degrees. At the end of the course students will: - Have acquired practical skills in the use of a light microscope. - Have an understanding of basic investigative techniques for disease detection in pathology. - Be able to evaluate diseased tissue at the macroscopic and microscopic level. - Have the ability to describe, synthesise and present information on disease pathogenesis. - Transfer problem-solving skills to novel situations related to disease pathogenesis. This unit of study would be appropriate for those who intend to proceed to Honours research, to postgraduate studies such as Medicine or to careers in biomedical areas such as hospital science. Enquiries should be directed to anthea.matsimanis@sydney.edu.au.

Textbooks

Kumar, Abbas and Aster. Robbins Basic Pathology, 9th edition. Saunders. 2012.

MICR3011
Microbes in Infection

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **Prohibitions:** MICR3911 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 2-hour exam; Practical (40%): case study: worksheet, lab work, presentation; one quiz; one 1-hour theory of prac exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The practical component is designed to enhance students' practical skills and to complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR et al. Medical Microbiology. 8th edition. Mosby. 2016.

MICR3911
Microbes in Infection (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week including six 1-hour tutorials, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester. **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** MICR3011 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1.5-hour exam (45%), one essay, one in-semester exam; Practical (40%): case study: worksheet, lab work, presentation; quiz; one 1-hour theory of prac exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is available to students who have performed well in Intermediate Microbiology. This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The unique aspect of this advanced unit that differentiates it from the mainstream unit is six tutorial style sessions that replace six mainstream lectures in the theme 'Emerging and re-emerging diseases'. These dedicated research-led interactive advanced sessions support self-directed learning and involve discussion around specific topics that will vary from year to year. Nominated research papers and reviews in the topic area will be explored with supported discussion of the relevance to and impact of the work on current thinking around emergence of microbial disease. The focus will be on microbial change that lies critically at the centre of understanding the reasons for the emergence of new diseases and challenges in an era of significant scientific ability to diagnose and treat infection. The practical component is identical to the mainstream unit and is designed to enhance students' practical skills and to complement the lectures. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR.et al. Medical Microbiology. 8th ed., Mosby, 2016

PHSI3009
Frontiers in Cellular Physiology

Credit points: 6 **Teacher/Coordinator:** A/Prof Anuwat Dinudom **Session:** Semester 1 **Classes:** 2 x 1hr/ week lectures and 6 x 2 hr large class tutorials (PBL) per semester **Prerequisites:** (PHSI2X05 and PHSI2X06) or (BMED2401 and an additional 12 credit points from BMED240X) **Prohibitions:** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3909 **Assessment:** four in-class quizzes, one mid-semester exam, one 2hr final exam, two presentations for problem-based learning and 1 practical class report **Practical field work:** 3 x 4 hr practicals per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: We strongly recommend that students take both (PHSI3009 or PHSI3909) and (PHSI3010 or PHSI3910) units of study concurrently

The aim of this unit is to provide students with advanced knowledge of cellular physiology. There will be a detailed exploration of the signals and pathways cells use to detect and respond to environmental changes and cues. Important signalling systems and homeostatic regulators will be discussed in the context of biological processes and human diseases. Problem-based learning sessions will explore these diseases with student-led teaching. Practical classes will explore physiological techniques for investigating cell signalling and the biophysical properties of cells. Large class tutorials will focus on graduate attribute skills development in the context of reinforcing material discussed in the lectures and practical classes. This unit will develop key attributes that are essential for a science graduate as they move forward in their careers.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3909
Frontiers in Cellular Physiology (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Anuwat Dinudom **Session:** Semester 1 **Classes:** 2 x 1hr/ week lectures and 3 x 2 hrs large class tutorials (PBL) per semester **Prerequisites:** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **Prohibitions:** PHSI3009, PHSI3005, PHSI3905, PHSI3006, PHSI3906 **Assessment:** four in-class quizzes, one mid-semester exam, one 2hr final exam, one presentations for problem-based learning and one Advanced research report **Practical field work:** 3 x 4 hr practicals per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of cellular physiology. There will be a detailed exploration of the signals and pathways cells use to detect and respond to environmental changes and cues. Important signalling systems and homeostatic regulators will be discussed in the context of biological processes and human diseases. Problem-based learning sessions will explore these diseases with student-led teaching. Practical classes will explore physiological techiques for investigating cell signalling and biophysical properties of cells. Large class tutorials will focus on graduate attribute skills development in the context of reinforcing material discussed in the lectures and practical classes. This unit will develop key attributes that are essential for science a graduate as they move forward in their careers.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3010
Reproduction, Development and Disease

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 1 **Classes:** 2 x 1hr lectures per week; 1 guest lecture/problem-based learning class introduction/organisation session per week. 2 x 3 hour problem-based learning classes per semester. **Prerequisites:** (PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02, BIOL2X29, GEGE2X01)] or [12cp from (BMED2402, BMED2403, BMED2406)] **Prohibitions:** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3910 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, two problem-solving learning tutorials, 3 practical class reports **Practical field work:** 3 x 3 hr practicals per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of the physiological processes that regulate normal and how these may go awry leading to significant human conditions or even disease. Lectures will focus on; male and female reproductive physiology, endocrinology of reproduction, physiology of fertilisation, cell cycle control and apoptosis, mechanisms of differentiation, gastrulation, cardiovascular development, tissue formation and organogenesis, stem cell biology and the link between developmental processes and cancer. Reprogramming and tissue regeneration will also feature in the lecture content. Problem-based learning will focus on reproductive physiology and regeneration. Practical classes will examine the processes regulating sperm function, embryogenesis and stem cell biology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3910
Reproduction, Development and Disease Adv

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 1 **Classes:** 2 x 1hr lectures per week; 1 guest lecture/problem-based learning class introduction/organisation session per week; 2 x 3 hour stem cell laboratory presentations per semester. **Prerequisites:** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02 or BIOL2X29 or GEGE2X01)] or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **Prohibitions:** PHSI3010, PHSI3005, PHSI3905, PHSI3006, PHSI3906 **Assessment:** one mid-semester MCQ exam, one 2hr final exam,stem cell labortory class (2 presentations), 3 practical class reports **Practical field work:** 4 x 4 hr practicals per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of the physiological processes that regulate normal and how these may go awry leading to significant human conditions or even disease. Lectures will focus on; male and female reproductive physiology, endocrinology of reproduction, physiology of fertilisation, cell cycle control and apoptosis, mechanisms of differentiation, gastrulation, cardiovascular development, tissue formation and organogenesis, stem cell biology and the link between developmental processes and cancer. Reprogramming and tissue regeneration will also feature in the lecture content. . Practical classes will examine the processes regulating sperm function, embryogenesis and stem cell biology. Students enrolling in PHSI3910 complete a separate laboratory class centered on stem cell differentiation to replace the problem-based learning exercises in PHSI3010.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

VIRO3001
Virology

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 26 1-hour lectures, seven 4-hour practical classes, one 2-hour tutorial **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3901 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam (60%) (120 minutes). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novel vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluorescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Tutorials cover a range of topical issues and provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3901
Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 29 1-hour lectures, seven 4-hour practical classes, four 1-hour tutorials **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** VIRO3001 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), individual presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam: (60%) (120 minutes) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Intermediate Microbiology and is based on VIRO3001 with additional lectures related to the research interests in the Discipline. Consequently, the unit of study content may change from year to year. Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novle vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluroescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Advanced lectures cover cutting-edge research in the field of virology in small group discussions and presentations that provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3002
Medical and Applied Virology

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1-hour lectures per week **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3902 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment and oral presentation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. Practical session slots are also used for oral presentations. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.

This unit of study explores diseases in human caused by viruses, with focus on the way viruses infect individual patients and spread in the community, and how virus infections are diagnosed, treated and/or prevented. Host/Virus interactions will also be described with a focus on the viral mechanisms that have evolved to combat and/or evade host defence systems. These features will be used to explain the symptoms, spread and control of the most medically important viruses that cause serious disease in humans . The unit will be taught by the Discipline of Infectious Diseases and Immunology within the Sydney Medical School with the involvement of associated clinical and research experts who will contribute lectures on their own special interests and with contributions from the Discipline of Microbiology. In the practical classes students will have the opportunity to develop their skills in performing methods currently used in diagnostic and research laboratories such as molecular analysis of viral genomes, immunofluorescent staining of viral antigens, cell culture and the culture of viruses.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3902
Medical and Applied Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, and one interactive 2-hour tutorials (approx 6 in total, including for oral presentations) **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **Prohibitions:** VIRO3002 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment, oral presentation and tutorial participation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.

This unit is based on the VIRO3002 course with inclusion of tutorials, including with leading research medical virologists, enabling students to gain additional experience with cutting edge virology research. The content of this unit may change from year to year based on research interests within the department.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

Table 1: Information Systems

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Information Systems			
For a major in Information Systems, the minimum requirement is 24 credit points chosen from the senior units of study listed for this subject area.			
Junior units of study			
INFO1110 **Introduction to Programming**	6		Intensive July Semester 1 Semester 2
INFO1113 **Object-Oriented Programming**	6	**P** INFO1110 **N** INFO1103 OR INFO1105 OR INFO1905	Semester 1 Semester 2
DATA1002 **Informatics: Data and Computation**	6	**N** INFO1903	Semester 2
INFO1911 **IT Special Project 1A**	6	*Note: Department permission required for enrolment*	Semester 1
INFO1912 **IT Special Project 1B**	6	*Note: Department permission required for enrolment*	Semester 2
Intermediate units of study			
COMP2017 **Systems Programming**	6	**P** INFO1113 OR INFO1105 OR INFO1905 OR INFO1103 **C** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **N** COMP2129	Semester 1
COMP2022 **Programming Languages, Logic and Models**	6	**A** MATH1004 OR MATH1904 OR MATH1064 OR MATH2069 OR MATH2969 **P** INFO1103 OR INFO1903 OR INFO1113 **N** COMP2922	Semester 2
COMP2123 **Data Structures and Algorithms**	6	**P** INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **N** INFO1105 OR INFO1905 OR COMP2823	Semester 1
ISYS2110 **Analysis and Design of Web Info Systems**	6	**P** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 **N** INFO2110	Semester 1
ISYS2120 **Data and Information Management**	6	**A** Programming skills **P** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 OR INFO1003 OR INFO1903 OR DECO1012 **N** INFO2120 OR INFO2820 OR COMP5138	Semester 2
ISYS2160 **Information Systems in the Internet Age**	6	**A** INFO1003 OR INFO1103 OR INFO1903 OR INFO1113 **N** ISYS2140	Semester 2
INFO2150 **Introduction to Health Data Science**	6	**A** Basic knowledge of Entity Relationship Modelling, database technology and SQL **P** (INFO1003 OR INFO1903 OR INFO1103 OR INFO1110 OR DATA1002) AND (DATA1001 OR MATH1005 OR MATH1905 OR MATH1015) **C** DATA2001 or ISYS2120 OR INFO2120 OR INFO2820 OR INFO1903	Semester 2
INFO2222 **Computing 2 Usability and Security**	6	**P** 12CP 1000-level INFO	Semester 1
INFO2911 **IT Special Project 2A**	6	**P** [85% average in IT units of study in previous year] AND [Permission from the School of IT] *Note: Department permission required for enrolment*	Semester 1
INFO2912 **IT Special Project 2B**	6	**P** [85% average in IT units of study in previous year] AND [Permission from the School of IT] *Note: Department permission required for enrolment*	Semester 2
ISYS2160 **Information Systems in the Internet Age**	6	**A** INFO1003 OR INFO1103 OR INFO1903 OR INFO1113 **N** ISYS2140	Semester 2
Senior units of study			
INFO3220 **Object Oriented Design**	6	**P** INFO2110 and COMP2129	Semester 1
INFO3315 **Human-Computer Interaction**	6		Semester 2
INFO3333 **Computing 3 Management**	6	**P** 12CP 2000-level COMP, INFO or ISYS **C** INFO2222 **N** INFO3402	Semester 1
INFO3616 **Principles of Security and Security Eng**	6	**A** INFO1110 AND INFO1112 AND INFO1113 AND MATH1064. Knowledge equivalent to the above units is assumed; this means good programming skills in Python or a C-related language, basic networking knowledge, skills from discrete mathematics. A technical orientation is expected. **N** ELEC5616	Semester 1
DATA3404 **Data Science Platforms**	6	**A** This unit of study assumes that students have previous knowledge of database structures and of SQL. The prerequisite material is covered in DATA2001 or ISYS2120. Familiarity with a programming language (e.g. Java or C) is also expected. **P** DATA2001 OR ISYS2120 OR INFO2120 OR INFO2820 **N** INFO3504 OR INFO3404	Semester 1
INFO3406 **Introduction to Data Analytics**	6	**A** Basic statistics and database management. **P** (MATH1005 OR MATH1905) AND (INFO2120 OR INFO2820).	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
INFO3600 **Major Development Project (Advanced)**	12	**P** INFO3402 **N** COMP3615 or ISYS3400 *Note: Department permission required for enrolment* *Only available to students in BIT, BCST(Adv) or BSc(Adv).*	Semester 2
INFO3911 **IT Special Project 3A**	6	**P** [85% average in IT units of study in previous year] AND [Permission from the School of IT] *Note: Department permission required for enrolment* *Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units*	Semester 1
INFO3912 **IT Special Project 3B**	6	**P** [85% average in IT units of study in previous year] AND [Permission from the School of IT] *Note: Department permission required for enrolment* *Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units*	Semester 2
ISYS3400 **Information Systems Project**	6	**P** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160) **N** INFO3600 or ISYS3207	Semester 2
ISYS3401 **Information Technology Evaluation**	6	**P** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160)	Semester 1
ISYS3402 **Decision Analytics and Support Systems**	6	**A** Database Management AND Systems Analysis and Modelling **P** (ISYS2110 OR INFO2110) AND (ISYS2120 OR INFO2120)	Semester 2
ELEC3610 **E-Business Analysis and Design**	6	**N** EBUS3003	Semester 1

Information Systems

For a major in Information Systems, the minimum requirement is 24 credit points chosen from the senior units of study listed for this subject area.

Junior units of study

INFO1110
Introduction to Programming

Credit points: 6 **Session:** Intensive July, Semester 1, Semester 2 **Classes:** lectures, laboratories, seminars **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an essential starting point for software developers, IT consultants, and computer scientists to build their understanding of principle computer operation. Students will obtain knowledge and skills with procedural programming. Crucial concepts include defining data types, control flow, iteration, functions, recursion, the model of addressable memory. Students will be able to reinterpret a general problem into a computer problem, and use their understanding of the computer model to develop source code. This unit trains students with software development process, including skills of testing and debugging. It is a prerequisite for more advanced programming languages, systems programming, computer security and high performance computing.

INFO1113
Object-Oriented Programming

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** lectures, laboratories, seminars **Prerequisites:** INFO1110 **Prohibitions:** INFO1103 OR INFO1105 OR INFO1905 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Object-oriented (OO) programming is a technique that arranges code into classes, each encapsulating in one place related data and the operations on that data. Inheritance is used to reuse code from a more general class, in specialised situations. Most modern programming languages provide OO features. Understanding and using these are an essential skill to software developers in industry. This unit provides the student with the concepts and individual programming skills in OO programming, starting from their previous mastery of procedural programming.

DATA1002
Informatics: Data and Computation

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories, Project Work - own time **Prohibitions:** INFO1903 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers computation and data handling, integrating sophisticated use of existing productivity software, e.g. spreadsheets, with the development of custom software using the general-purpose Python language. It will focus on skills directly applicable to data-driven decision-making. Students will see examples from many domains, and be able to write code to automate the common processes of data science, such as data ingestion, format conversion, cleaning, summarization, creation and application of a predictive model.

INFO1911
IT Special Project 1A

Credit points: 6 **Session:** Semester 1 **Classes:** Meetings, Project Work - own time **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This is a unit of study for the junior student who is an academic high achiever as well as talented in IT areas. Students will be involved in advance projects (which may be research-oriented). They need to apply their problem solving and IT skills in the project. As a result, their horizon in computer science and information system is broadened.

INFO1912
IT Special Project 1B

Credit points: 6 **Session:** Semester 2 **Classes:** Meetings, Project Work - own time **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This is a unit of study for the junior student who is an academic high achiever and is talented in IT areas. Students will involve in advance projects which have research components, so that they can further demonstrate their IT and problem solving capabilities.

Intermediate units of study

COMP2017
Systems Programming

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, laboratories **Prerequisites:** INFO1113 OR INFO1105 OR INFO1905 OR INFO1103 **Corequisites:** COMP2123 OR COMP2823 OR INFO1105 OR INFO1905 **Prohibitions:** COMP2129 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this unit of study, elementary methods for developing robust, efficient, and re-usable software will be covered. The unit is taught in C, in a Unix environment. Specific coding topics include memory management, the pragmatic aspects of implementing data structures such as lists and hash tables and managing concurrent threads.

Debugging tools and techniques are discussed and common programming errors are considered along with defensive programming techniques to avoid such errors. Emphasis is placed on using common Unix tools to manage aspects of the software construction process, such as version control and regression testing. The subject is taught from a practical viewpoint and it includes a considerable amount of programming practice.

COMP2022
Programming Languages, Logic and Models
Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials **Prerequisites:** INFO1103 OR INFO1903 OR INFO1113 **Prohibitions:** COMP2922 **Assumed knowledge:** MATH1004 OR MATH1904 OR MATH1064 OR MATH2069 OR MATH2969 **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to the foundations of computational models, and their connection to programming languages/tools. The unit covers various abstract models for computation including Lambda Calculus, and Logic calculi (e. g. concept of formal proofs in propositional, predicate, and temporal logic). For each abstract model, we introduce programming languages/tools that are built on the introduced abstract computational models. We will discuss functional languages including Scheme/Haskell, and Prolog/Datalog.

COMP2123
Data Structures and Algorithms
Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** INFO1110 OR INFO1113 OR DATA1002 OR INFO1103 OR INFO1903 **Prohibitions:** INFO1105 OR INFO1905 OR COMP2823 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will teach some powerful ideas that are central to solving algorithmic problems in ways that are more efficient than naive approaches. In particular, students will learn how data collections can support efficient access, for example, how a dictionary or map can allow key-based lookup that does not slow down linearly as the collection grows in size. The data structures covered in this unit include lists, stacks, queues, priority queues, search trees, hash tables, and graphs. Students will also learn efficient techniques for classic tasks such as sorting a collection. The concept of asymptotic notation will be introduced, and used to describe the costs of various data access operations and algorithms.

ISYS2110
Analysis and Design of Web Info Systems
Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, tutorials **Prerequisites:** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 **Prohibitions:** INFO2110 **Assessment:** through semester assessment (40%), final exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course discusses the processes, methods, techniques and tools that organisations use to determine how they should conduct their business, with a particular focus on how web-based technologies can most effectively contribute to the way business is organized. The course covers a systematic methodology for analysing a business problem or opportunity, determining what role, if any, web-based technologies can play in addressing the business need, articulating business requirements for the technology solution, specifying alternative approaches to acquiring the technology capabilities needed to address the business requirements, and specifying the requirements for the information systems solution in particular, in-house development, development from third-party providers, or purchased commercial-off-the-shelf (COTS) packages.

ISYS2120
Data and Information Management
Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials, Laboratories, Project Work - own time **Prerequisites:** INFO1113 OR INFO1103 OR INFO1105 OR INFO1905 OR INFO1003 OR INFO1903 OR DECO1012 **Prohibitions:** INFO2120 OR INFO2820 OR COMP5138 **Assumed knowledge:** Programming skills **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The ubiquitous use of information technology leaves us facing a tsunami of data produced by users, IT systems and mobile devices. The proper management of data is hence essential for all applications and for effective decision making within organizations.

This unit of study will introduce the basic concepts of database designs at the conceptual, logical and physical levels. We will place particular emphasis on introducing integrity constraints and the concept of data normalization which prevents data from being corrupted or duplicated in different parts of the database. This in turn helps in the data remaining consistent during its lifetime. Once a database design is in place, the emphasis shifts towards querying the data in order to extract useful information. The unit will introduce the SQL database query languages, which is industry standard. Other topics covered will include the important concept of transaction management, application development with a backend database, and an overview of data warehousing and OLAP.

ISYS2160
Information Systems in the Internet Age
Credit points: 6 **Session:** Semester 2 **Classes:** lectures, tutorials **Prohibitions:** ISYS2140 **Assumed knowledge:** INFO1003 OR INFO1103 OR INFO1903 OR INFO1113 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive conceptual and practical introduction to information systems (IS) in the Internet era. Key topics covered include: system thinking and system theory, basic concepts of information systems, internet and e-commerce, e-payment and m-commerce, online marketing and social media, information systems for competitive advantage, functional and enterprise systems, business intelligence, information systems development and acquisition, information security, ethics, and privacy

INFO2150
Introduction to Health Data Science
Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials **Prerequisites:** (INFO1003 OR INFO1903 OR INFO1103 OR INFO1110 OR DATA1002) AND (DATA1001 OR MATH1005 OR MATH1905 OR MATH1015) **Corequisites:** DATA2001 or ISYS2120 OR INFO2120 OR INFO2820 OR INFO1903 **Assumed knowledge:** Basic knowledge of Entity Relationship Modelling, database technology and SQL **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Health organisations cannot function effectively without computer information systems. Clinical data are stored and distributed in different databases, different formats and different locations. It requires a lot of effort to create an integrated and clean-up version of data from multiple sources, This unit provides basic introduction to the process and knowledge to enable the analysis of health data. The unit will be of interest to students seeking the understanding of the various coding standards in health industry, data retrieval from databases, data linkage issue, cleaning and pre-processing steps, necessary statistical techniques and presentation of results.

It will be valuable to those who want to work as health-related occupations, such as health informatics analysts, healthcare administrators, medical and health services manager or research officers in hospitals, government health agencies and research organisations. Having said that, a good understanding of health data analysis is a useful asset to all students.

INFO2222
Computing 2 Usability and Security
Credit points: 6 **Session:** Semester 1 **Classes:** Meetings, Laboratories, Project Work - own time **Prerequisites:** 12CP 1000-level INFO **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an integrated treatment of two critical topics for a computing professional: human computer interaction (HCI) and security. The techniques and core ideas of HCI will be studied with a particular focus on examples and case studies related to security. This unit builds the students' awareness of the deep challenges in creating computing systems that can meet people's needs for both HCI and security. It will develop basic skills to evaluate systems for their effectiveness in meeting people's needs within the contexts of their use, building knowledge of common mistakes in systems, and approaches to avoid those mistakes.

INFO2911
IT Special Project 2A

Credit points: 6 **Session:** Semester 1 **Classes:** Meetings, Project Work - own time **Prerequisites:** [85% average in IT units of study in previous year] AND [Permission from the School of IT] **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit enables talented students to apply their IT knowledge from the junior years to do more exciting projects. Students are provided with the opportunities to get involved in projects which are research intensive.

INFO2912
IT Special Project 2B

Credit points: 6 **Session:** Semester 2 **Classes:** Meetings, Project Work - own time **Prerequisites:** [85% average in IT units of study in previous year] AND [Permission from the School of IT] **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit enables talented students to apply their IT knowledge from their junior years to do more exciting projects. Students are provided with the opportunities to get involved in projects which are research intensive.

ISYS2160
Information Systems in the Internet Age

Credit points: 6 **Session:** Semester 2 **Classes:** lectures, tutorials **Prohibitions:** ISYS2140 **Assumed knowledge:** INFO1003 OR INFO1103 OR INFO1903 OR INFO1113 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive conceptual and practical introduction to information systems (IS) in the Internet era. Key topics covered include: system thinking and system theory, basic concepts of information systems, internet and e-commerce, e-payment and m-commerce, online marketing and social media, information systems for competitive advantage, functional and enterprise systems, business intelligence, information systems development and acquisition, information security, ethics, and privacy

Senior units of study

INFO3220
Object Oriented Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials, Project Work - own time **Prerequisites:** INFO2110 and COMP2129 **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers essential design methods and language mechanisms for successful object-oriented design and programming. C++ is used as the implementation language and a special emphasis is placed on those features of C++ that are important for solving real-world problems. Advanced software engineering features, including exceptions and name spaces are thoroughly covered.

INFO3315
Human-Computer Interaction

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a first subject in HCI, Human Computer Interaction. It is designed for students who want to be involved in one of the many roles required to create future technology. There are three main parts: the human foundations from psychology and physiology; HCI methods for design and evaluation of interfaces; leading edge directions for technologies.

This subject is highly multi-disciplinary. At the core, it is a mix of Computer Science Software Engineering combined with the design discipline, UX - User Experience. It draws on psychology, both for relevant theories and user study methods. The practical work is human-centred with project work that motivates the formal curriculum. This year the projects will be in area of health and wellness.

INFO3333
Computing 3 Management

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** 12CP 2000-level COMP, INFO or ISYS **Corequisites:** INFO2222 **Prohibitions:** INFO3402 **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit teaches students vital skills for an effective professional career: preparing them to eventually be a leader, who ensures that others achieve high-quality outcomes. Building on experiences from earlier units (that covered working in a team, agile development practices, paying attention to needs and characteristics of users, and the value of data) this unit teaches students key concepts needed as a manager, or when working with managers. The focus includes managing projects, managing services, and ensuring governance.

INFO3616
Principles of Security and Security Eng

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials, research **Prohibitions:** ELEC5616 **Assumed knowledge:** INFO1110 AND INFO1112 AND INFO1113 AND MATH1064. Knowledge equivalent to the above units is assumed; this means good programming skills in Python or a C-related language, basic networking knowledge, skills from discrete mathematics. A technical orientation is expected. **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to the many facets of security in the digital and networked world, the challenges that IT systems face, and the design principles that have been developed to build secure systems and counter attacks. The unit puts the focus squarely on providing a thorough understanding of security principles and engineering for security. At the same time, we stress a hands-on approach to teach the state-of-the-art incarnations of security principles and technology, and we practice programming for security. We pay particular attention to the fact that security is much more than just technology as we discuss the fields of usability in security, operational security, and cyber-physical systems. At the end of this unit, graduates are prepared for practical demands in their later careers and know how to tackle new, yet unforeseen challenges.

This unit also serves as the initial step for a specialisation in computer and communications security.

DATA3404
Data Science Platforms

Credit points: 6 **Session:** Semester 1 **Classes:** lectures, tutorials **Prerequisites:** DATA2001 OR ISYS2120 OR INFO2120 OR INFO2820 **Prohibitions:** INFO3504 OR INFO3404 **Assumed knowledge:** This unit of study assumes that students have previous knowledge of database structures and of SQL. The prerequisite material is covered in DATA2001 or ISYS2120. Familiarity with a programming language (e.g. Java or C) is also expected. **Assessment:** through semester assessment (40%), final exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides a comprehensive overview of the internal mechanisms data science platforms and of systems that manage large data collections. These skills are needed for successful performance tuning and to understand the scalability challenges faced by when processing Big Data. This unit builds upon the second' year DATA2001 - 'Data Science - Big Data and Data Diversity' and correspondingly assumes a sound understanding of SQL and data analysis tasks.

The first part of this subject focuses on mechanisms for large-scale data management. It provides a deep understanding of the internal components of a data management platform. Topics include: physical data organization and disk-based index structures, query processing and optimisation, and database tuning.

The second part focuses on the large-scale management of big data in a distributed architecture. Topics include: distributed and replicated databases, information retrieval, data stream processing, and web-scale data processing.

The unit will be of interest to students seeking an introduction to data management tuning, disk-based data structures and algorithms, and information retrieval. It will be valuable to those pursuing such careers as Software Engineers, Data Engineers, Database Administrators, and Big Data Platform specialists.

INFO3406
Introduction to Data Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories **Prerequisites:** (MATH1005 OR MATH1905) AND (INFO2120 OR INFO2820). **Assumed knowledge:** Basic statistics and database management. **Assessment:** Through semester assessment (40%) and Final Exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Big Data refers to datasets that are massive, heterogenous, and dynamic that are beyond current approaches for the capture, storage, management, and analysis of the data. The focus of this unit is on understanding and applying relevant concepts, techniques, algorithms, and tools for the analysis, management and visualization of big data - with the goal of keeping abreast of the continual increase in the volume and complexity of data sets and enabling discovery of information and knowledge to guide effective decision making.

INFO3600
Major Development Project (Advanced)

Credit points: 12 **Session:** Semester 2 **Classes:** Project Work - in class, Site Visits, Project Work - own time, Meetings **Prerequisites:** INFO3402 **Prohibitions:** COMP3615 or ISYS3400 **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Only available to students in BIT, BCST(Adv) or BSc(Adv).

This unit will provide students an opportunity to apply the knowledge and practise the skills acquired in the prerequisite and qualifying units, in the context of designing and building a substantial software development system in diverse application domains including life sciences. Working in groups for an external client combined with academic supervision, students will need to carry out the full range of activities including requirements capture, analysis and design, coding, testing and documentation. Students will use the XP methodology and make use of professional tools for the management of their project.

INFO3911
IT Special Project 3A

Credit points: 6 **Session:** Semester 1 **Classes:** Meetings, Project Work - own time **Prerequisites:** [85% average in IT units of study in previous year] AND [Permission from the School of IT] **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units

This unit enables talents students with maturing IT knowledge to integrate various IT skills and techniques to carry out projects. These projects are largely research intensive.

INFO3912
IT Special Project 3B

Credit points: 6 **Session:** Semester 2 **Classes:** Meetings, Project Work - own time **Prerequisites:** [85% average in IT units of study in previous year] AND [Permission from the School of IT] **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment by department permission for students with 85% average in School of IT units plus minimum 75% average in other units

This unit enables talents students with maturing IT knowledge to integrate various IT skills and techniques to carry out projects. These projects are largely research intensive.

ISYS3400
Information Systems Project

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class, Project Work - own time, Site Visits, Meetings **Prerequisites:** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160) **Prohibitions:** INFO3600 or ISYS3207 **Assessment:** Through semester assessment (80%) and Final Exam (20%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide students an opportunity to apply the knowledge and practise the skills acquired in the prerequisite and qualifying units, in the context of a substantial information systems research or development project and to experience in a realistic way many aspects of analysing and solving information systems problems. Since information systems projects are often undertaken by small teams, the experience of working in a team is seen as an important feature of the unit. Students often find it difficult to work effectively with others and will benefit from the opportunity provided by this unit to further develop this skill.

ISYS3401
Information Technology Evaluation

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials **Prerequisites:** (INFO2110 OR ISYS2110) AND (INFO2120 OR ISYS2120) AND (ISYS2140 OR ISYS2160) **Assessment:** Through semester assessment (35%) and Final Exam (65%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Information Systems (IS) professionals in today's organisations are required to play leadership roles in change and development. Your success in this field will be aided by your being able to carry out research-based investigations using suitable methods and mastery over data collection and analysis to assist in managing projects and in decision making. Practical research skills are some of the most important assets you will need in your career.

This unit of study will cover important concepts and skills in practical research for solving and managing important problems. This will also provide you with the skills to undertake the capstone project in the IS project unit of study offered in Semester 2 or other projects. It will also provide hand-on experience of using Microsoft Excel and other tools to perform some of the quantitative analysis.

ISYS3402
Decision Analytics and Support Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Laboratories, Project Work - own time **Prerequisites:** (ISYS2110 OR INFO2110) AND (ISYS2120 OR INFO2120) **Assumed knowledge:** Database Management AND Systems Analysis and Modelling **Assessment:** through semester assessment (50%), final exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

With the rapid increases in the volume and variety of data available, the problem of providing effective support to facilitate good decision making has become more challenging. This unit of study will provide a comprehensive understanding the diverse types of decision and the decision making processes. It will introduce decision modelling and the design and implementation of application systems to support decision making in organisational contexts. It will include a range of business intelligence and analytics solutions based on online analytical processing (OLAP) models and technologies. The unit will also cover a number of modelling approaches (optimization, predictive, descriptive) and their integration in the context of enabling improved, data-driven decision making.

ELEC3610
E-Business Analysis and Design

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - in class, Project Work - own time, Presentation, Tutorials **Prohibitions:** EBUS3003 **Assessment:** Through semester assessment (70%) and Final Exam (30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines the essential pre-production stages of designing successful internet websites and services. It focuses on the aspects of analysis, project specification, design, and prototype that lead up to the actual build of a website or application. Topics include, B2C, B2B and B2E systems, business models, methodologies, modeling with use cases / UML and WebML, the Project Proposal and Project Specification Document, Information Architecture and User-Centred Design, legal issues, and standards-based web development. Students build a simple use-case based e-business website prototype with web standards. A final presentation of the analysis, design and prototype are presented in a role play environment where students try to win funding from a venture capitalist. An understanding of these pre-production fundamentals is critical for future IT and Software Engineering Consultants, Project Managers, Analysts and CTOs.

Table 1: Marine Science

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Marine Science For a major in Marine Science, the minimum requirement is 24 credit points of senior units listed below. This must include at least 6 credit points of GEOS3XXX, and BIOL3013/3913 Marine Biology as a compulsory core unit of study. The Intermediate units listed below provide recommended pathways to the senior units in the Marine Science major.			
Intermediate units of study			
BIOL2024 **Ecology and Conservation**	6	**A** BIOL1XXX or MBLG1XXX **N** BIOL2924	Semester 2
BIOL2924 **Ecology and Conservation (Advanced)**	6	**A** BIOL1XXX or MBLG1XXX **P** An annual average mark of at least 70 in the previous year **N** BIOL2024	Semester 2
GEOS2115 **Oceans, Coasts and Climate Change**	6	**A** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **P** 24 credit points from Junior Units of Study **N** GEOS2915 or MARS2006	Intensive July Semester 1
GEOS2915 **Oceans, Coasts and Climate Change (Adv)**	6	**A** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **P** Distinction average in 48 credit points from Junior units of study. **N** GEOS2115 or MARS2006	Semester 1
Senior units of study			
BIOL3007 **Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3907	Semester 2
BIOL3907 **Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3007	Semester 2
BIOL3008 **Marine Field Ecology** *This unit of study is not available in 2018*	6	**P** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **N** BIOL3908 or BIOL2028 or BIOL2928 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive July
BIOL3908 **Marine Field Ecology (Advanced)** *This unit of study is not available in 2018*	6	**P** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **N** BIOL3008 or BIOL2028 or BIOL2928 *Note: Department permission required for enrolment* *This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.*	Intensive July
BIOL3013 **Marine Biology**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3913	Semester 2
BIOL3913 **Marine Biology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3013	Semester 2
BIOL3016 **Coral Reef Biology**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3916 or BIOL2020 or BIOL2920 or NTMP3001 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
BIOL3916 **Coral Reef Biology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3016 or BIOL2020 or BIOL2920 or NTMP3001 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July
BIOL3045 **Animal Ecological Physiology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3945 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912	Semester 1
BIOL3945 **Animal Ecological Physiology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3045 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912	Semester 1
BIOL3046 **Animal Behaviour**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3946 or BIOL3025 or BIOL3925	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL3946 **Animal Behaviour (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3046 or BIOL3025 or BIOL3925 *Note: Department permission required for enrolment*	Semester 1
GEOS3009 **Coastal Environments and Processes**	6	**P** (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics or Mathematics or Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **N** GEOS3909 or MARS3003 or MARS3105	Semester 1
GEOS3909 **Coastal Environments and Processes (Adv)**	6	**P** Distinction average in (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics, Mathematics, Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **N** GEOS3009 or MARS3003 or MARS3105 *A distinction average in prior Geography or Geology units is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.*	Semester 1
GEOS3014 **GIS in Coastal Management**	6	**P** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **N** GEOS3914 or MARS3104	Semester 2
GEOS3914 **GIS in Coastal Management (Advanced)**	6	**P** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **N** GEOS3014 or MARS3104 *Note: Department permission required for enrolment* *A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.*	Semester 2
GEOS3103 **Environmental and Sedimentary Geology**	6	**A** (GEOS1003 or GEOS1903) **P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3803	Semester 2
GEOS3803 **Environmental and Sedimentary Geology(Adv)**	6	**A** (GEOS1003 or GEOS1903) **P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3103 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 2
GEOS3104 **Geophysical Methods**	6	**P** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **N** GEOS3804 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 or GEOS3004	Semester 2
GEOS3804 **Geophysical Methods (Advanced)**	6	**P** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **N** GEOS3104 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 *Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.*	Semester 2

Note: BIOL3016/3916 runs in EVEN years only.

Marine Science

For a major in Marine Science, the minimum requirement is 24 credit points of senior units listed below. This must include at least 6 credit points of GEOS3XXX, and BIOL3013/3913 Marine Biology as a compulsory core unit of study.The Intermediate units listed below provide recommended pathways to the senior units in the Marine Science major.

Intermediate units of study

BIOL2024
Ecology and Conservation

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prohibitions:** BIOL2924 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines the ecological principles driving the major ecosystems of the world and ecological processes behind the world's major conservation issues. It aims to develop in students the core foundations for an understanding of Ecology and its application in conservation. Lectures will focus on the ecology of the major terrestrial and marine biomes of the world. Application of ecological theory and methods to practical conservation problems will be integrated throughout the unit of study. Practical sessions will provide hands-on experience in ecological sampling and data handling to understand the ecology of marine and terrestrial environments, as well as ecological simulations to understand processes. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

BIOL2924
Ecology and Conservation (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An annual average mark of at least 70 in the previous year **Prohibitions:** BIOL2024 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2924 will be based on BIOL2024 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

GEOS2115
Oceans, Coasts and Climate Change

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Müller, A/Prof Jody Webster, A.Prof Ana Vila-Concejo **Session:** Intensive July, Semester 1 **Classes:** Twenty-five 1 hour lectures, three 1 hour workshops, eight 2 hour practical classes. **Prerequisites:** 24 credit points from Junior Units of Study **Prohibitions:** GEOS2915 or MARS2006 **Assumed knowledge:** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **Assessment:** Lab reports (60%), one 2-hour exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces core concepts about how the formation of ocean basins and their influence on climate govern the development of coasts and continental margins. These concepts provide a framework for understanding the geographic variation of coasts, continental shelves and sediment accumulations in the deep ocean. Ocean-basin evolution is explained in terms of movements within the Earth's interior and how these movements determine the geometry of ocean basins, and their alpine counterparts, which interact with the global circulation of the ocean and atmosphere. This interaction plays a key role in marine sedimentation and controls the environmental conditions responsible for the development of coral reefs and other ecosystems. The Unit of Study systematically outlines how these factors have played out to produce, by gradual change, the coasts we see today, as well as the less familiar deposits hidden beneath the sea and coastal lands. The Unit thereby outlines how knowledge of responses to climate change in the past allow us to predict environmental responses to accelerated climate change occurring now and in the future due to the industrial greenhouse effect, but places these responses into perspective against the geological record. Overall therefore, the Unit aims to provide familiarity with fundamental phenomena central to the study of marine geoscience and environmental impacts, introduced through process-oriented explanations. The Unit of Study is structured around GIS-based practical sessions and problem-based project work, for which lectures provide the theoretical background.

Textbooks

On line reading material provided via Fisher Library

GEOS2915
Oceans, Coasts and Climate Change (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Muller **Session:** Semester 1 **Classes:** Twenty-five 1 hour lectures, three 1 hour workshops, eight 2 hour practical classes. **Prerequisites:** Distinction average in 48 credit points from Junior units of study. **Prohibitions:** GEOS2115 or MARS2006 **Assumed knowledge:** GEOG1001 or GEOL1001 or GEOL1002 or GEOS1003 or GEOS1903 or ENVI1002 or GEOL1902 or GEOL1501 **Assessment:** Lab reports (60%), one 2 hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as GEOS2115 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance to date. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives.

Textbooks

Online reading materials are provided via Fisher Library.

Senior units of study

BIOL3007
Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3907 **Assessment:** One 2-hour exam, group presentations, one essay, one project report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the dynamics of ecological systems, and considers the interactions between individual organisms and populations, organisms and the environment, and ecological processes. Lectures are grouped around four dominant themes: Interactions, Evolutionary Ecology, The Nature of Communities, and Conservation and Management. Emphasis is placed throughout on the importance of quantitative methods in ecology, including sound planning and experimental designs, and on the role of ecological science in the conservation, management, exploitation and control of populations. Relevant case studies and examples of ecological processes are drawn from marine, freshwater and terrestrial systems, with plants, animals, fungi and other life forms considered as required. Students will have some opportunity to undertake short term ecological projects, and to take part in discussions of important and emerging ideas in the ecological literature.

Textbooks

Begon M, Townsend CR, Harper JL (2005) Ecology, From individuals to ecosystems. Wiley-Blackwell.

BIOL3907
Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two lectures per week, weekly tutorial and 3-hour practical per week **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3007 **Assessment:** One 2-hour exam, presentations, one essay, one project report (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as BIOL3007 Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study participate in alternatives to some elements of the standard course and will be encouraged to pursue the objectives by more independent means in a series of research tutorials. Specific details of this unit of study and assessment will be announced in meetings with students in week 1 of semester 2. This unit of study may be taken as part of the BSc (Advanced) program.

Textbooks

As for BIOL3007

BIOL3008
Marine Field Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Ross Coleman **Session:** Intensive July **Classes:** Intensive 8-day field course held in the pre-semester break. **Prerequisites:** 12 credit points of Intermediate BIOL, or (6 credit points of Intermediate BIOL and (MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3908 or BIOL2028 or BIOL2928 **Assessment:** Discussion groups, research project proposal, biodiversity survey report, data analysis and checking, research project report (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This field course provides a practical introduction to the experimental analysis of marine populations and assemblages. Students gain experience using a range of intertidal sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. No particular mathematical or statistical skills are required for this subject. Group experimental research projects in the field are the focus of the unit during the day, with lectures and discussion groups about the analysis of experimental data and current issues in experimental marine ecology occurring in the evening.

Textbooks

No textbook is prescribed but Coastal Marine Ecology of Temperate Australia. Eds. Underwood, A.J. & Chapman, M.G. 1995. University of New South Wales Press, provides useful background reading.

BIOL3908
Marine Field Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Ross Coleman. **Session:** Intensive July **Classes:** One 8-day field course held in the pre-semester break, plus four 1-hour tutorials during semester 2. **Prerequisites:** Distinction average in either- 12cp Intermediate BIOL, or (6cp Intermediate BIOL and(MBLG2072 or MBLG2972)) **Prohibitions:** BIOL3008 or BIOL2028 or BIOL2928 **Assessment:** Discussion groups, research project proposal, biodiversity report, data analysis and checking, research project report (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit cannot be combined with more than one other BIOL field unit during the degree. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any senior BIOL units of study may also be considered. The unit is only available in ODD years (2015, 2017?) but students may apply for entry into an alternative Intermediate field unit in EVEN years.

This unit has the same objectives as Marine Field Ecology BIOL3008, and is suitable for students wishing to pursue certain aspects of marine field ecology in a greater depth. Entry is restricted and selection is made from applicants on the basis of past performance. Students taking this unit of study will be expected to take part in a number of additional tutorials after the field course on advanced aspects of experimental design and analysis and will be expected to incorporate these advanced skills into their analyses and project reports. This unit may be taken as part of the BSc(Advanced).

Textbooks
As for BIOL 3008.

BIOL3013
Marine Biology

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 4-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3913 **Assessment:** Practical reports, data exercises and exams (100%). **Practical field work:** Combination of field, lab and computer based practical activities **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

We will examine in detail processes that are important for the establishment and maintenance of marine communities. Lectures will expose students to the key ideas, researchers and methodologies within selected fields of marine biology. Laboratory sessions and field excursions will complement the lectures by providing students with hands-on experience with the organisms and the processes that affect them. Students will develop critical analysis and scientific writing skills while examining the current literature.

BIOL3913
Marine Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Semester 2 **Classes:** See BIOL3013. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3013 **Assessment:** Practical reports, data exercises and exams (100%). **Practical field work:** Combination of field, lab and computer-based practical activities **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of the BIOL3013 Marine Biology unit. The content and nature of these components may vary from year to year but generally involves an individual or group project, conducted with unit instructors, which takes the place of one of the practical-based assessments..

BIOL3016
Coral Reef Biology

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Intensive July **Classes:** Fieldwork 80 hours block mode (during July) **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3916 or BIOL2020 or BIOL2920 or NTMP3001 **Assessment:** Participation in field work, essay, project report and an exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

Coral Reef Biology is an intensive unit held at a research station on the Great Barrier Reef. The unit focuses on the dominant taxa in coral reef environments and the linkages between them. Emphasis is placed on the biological adaptations for life in tropical waters and the ecological, oceanographic and physiological processes involved. Aspects covered include: processes influencing the distribution of coral reefs, symbiosis, reef connectivity, lagoon systems, nutrient cycling and the impacts of climate change and other anthropogenic pressures on the world's corals reefs.

BIOL3916
Coral Reef Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Will Figueira **Session:** Intensive July **Classes:** Fieldwork 80 hours block mode (during July) **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3016 or BIOL2020 or BIOL2920 or NTMP3001 **Assessment:** Participation in field work, essay, project report and exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

This unit has the same objectives as BIOL3016, Coral Reef Biology, and is suitable for students who wish to pursue certain aspects of tropical marine biology in greater depth, with a focus on the GBR. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study will pursue individual projects in consultation with, and under the guidance of, the course coordinator. The aim is to design a project relating to the particular interests of the student. The nature of these projects will vary from year to year. This unit of study may be taken as part of the BSc (Advanced) program.

BIOL3045
Animal Ecological Physiology

Credit points: 6 **Teacher/Coordinator:** Prof Frank Seebacher **Session:** Semester 1 **Classes:** Two lectures and three practicals per week **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3945 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912 **Assessment:** Two practical reports (20% and 40% of total marks, respectively), one 1.5-hour exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Animal Ecological Physiology is a conceptually based unit of study that covers physiological interactions between organisms and their environments. The unit explores evolutionary processes that allow animals to persist in variable environments. These concepts are essential to understanding biodiversity and ecological function of animal populations, and how these are likely to change under future climate change. The unit will be suitable for those with an interest in zoology, as well as students with a particular interest in ecology and evolution. There is a strong focus on experimental biology and incorporating theory into practical classes, during which students design their own experiments. Good working knowledge of statistical analyses is assumed. The unit provides essential skills for conducting and presenting research, and for critical evaluation of published research.

BIOL3945
Animal Ecological Physiology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Frank Seebacher **Session:** Semester 1 **Classes:** Two lectures and three practicals per week. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3045 or BIOL3011 or BIOL3911 or BIOL3012 or BIOL3912 **Assessment:** One practical report (20%) and one advanced report (40%), one 1.5-hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content will be based on the standard unit BIOL3045 but qualified students will participate in alternative components at a more advanced level. Animal Ecological Physiology is a conceptually based unit of study that covers physiological interactions between organisms and their environments. The unit explores evolutionary processes that allow animals to persist in variable environments. These concepts are essential to understanding biodiversity and ecological function of animal populations, and how these are likely to change under future climate change. The unit will be suitable for those with an interest in zoology, as well as students with a particular interest in ecology and evolution. There is a strong focus on experimental biology and incorporating theory into practical classes, during which students design their own experiments. Good working knowledge of statistical analyses is assumed. The unit provides essential skills for conducting and presenting research, and for critical evaluation of published research.

BIOL3046
Animal Behaviour

Credit points: 6 **Teacher/Coordinator:** Prof Ashley Ward **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3946 or BIOL3025 or BIOL3925 **Assessment:** Practical reports, one 2-hour exam (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit will provide a broad overview of the scientific study of animal behaviour. It will consider mechanistic and functional explanations of animal behaviour across contexts including kin selection and altruism, sociality, foraging, aggression and competition, sexual selection and mate choice, the behaviour of predators and prey, and communication and signalling. The information presented and discussed in this unit will reflect the most up-to-date research in each aspect of the field of animal behaviour. Practical sessions are closely aligned with the lecture material and will foster the development of key skills by providing hands-on experience of experimental design, data collection and analysis.

Textbooks

Davies, Krebs, West: An Introduction to Behavioural Ecology, 4th edition, Wiley-Blackwell.

BIOL3946
Animal Behaviour (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Ashley Ward **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3046 or BIOL3025 or BIOL3925 **Assessment:** Practical reports, one 2-hour exam (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The content will be based on the standard unit BIOL3046 but qualified students will participate in alternative components at a more advanced level. The unit will provide a broad overview of the scientific study of animal behaviour. It will consider mechanistic and functional explanations of animal behaviour across contexts including kin selection and altruism, sociality, foraging, aggression and competition, sexual selection and mate choice, the behaviour of predators and prey, and communication and signalling. The information presented and discussed in this unit will reflect the most up-to-date research in each aspect of the field of animal behaviour. Practical sessions are closely aligned with the lecture material and will foster the development of key skills by providing hands-on experience of experimental design, data collection and analysis.

Textbooks

Davies, Krebs, West: An Introduction to Behavioural Ecology, 4th edition, Wiley-Blackwell.

GEOS3009
Coastal Environments and Processes

Credit points: 6 **Teacher/Coordinator:** A/Prof Jody Webster, A/Prof Ana Vila-Concejo, Dr Tristan Salles **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week; weekend excursion. **Prerequisites:** (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics or Mathematics or Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **Prohibitions:** GEOS3909 or MARS3003 or MARS3105 **Assessment:** One 2 hour exam, research reports and an online quiz (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this course is to introduce students to a variety of Coastal Environments and the major processes which control the morphodynamic evolution of these systems. The course offers a unique opportunity of learning the full spectrum of marine sedimentary environments from siliciclastic, temperate, highly urbanised and impacted estuarine ecosytems to carbonate, tropical, pristine and undeveloped/protected coastal and continental margin environments. The course is divided in three sections: Section A covers the basic morphodynamics and processes impacting carbonate-dominated coastal and continental margin environments. The focus is on carbonate reefal and margin systems and their geologic and biologic responses to past, present and future environmental changes; Section B covers the basic morphodynamics of temperate and tropical coasts, including beach morphodynamics and basic knowledge on waves and currents; Section C consolidates all concepts learnt in the previous sections by applying them to numerical modelling.

There is a compulsory weekend fieldtrip to the NSW coast to study beach morphodynamics and fieldwork techniques. Depending on the year, there may be a voluntary fieldtrip to a coral reef environment, for example, The University of Sydney One Tree Island Research Station.

Textbooks

List of selected readings provided online.

GEOS3909
Coastal Environments and Processes (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Jody Webster **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour practical per week; weekend excursion **Prerequisites:** Distinction average in (6 credit points of Intermediate Geoscience units) and (6 further credit points of Intermediate Geoscience or 6 credit points of Physics, Mathematics, Information Technology or Engineering units) or ((MARS2005 or MARS2905) and (MARS2006 or MARS2906)) **Prohibitions:** GEOS3009 or MARS3003 or MARS3105 **Assessment:** One 2 hour exam, research reports and an online quiz (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A distinction average in prior Geography or Geology units is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3009 but will carry out more challenging projects, practicals, assignments and tutorials.

GEOS3014
GIS in Coastal Management

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** 2x1 hour lectures and 1x3h practical/week **Prerequisites:** Either 12 credit points of Intermediate Geoscience units or [(GEOS2115, GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)] **Prohibitions:** GEOS3914 or MARS3104 **Assessment:** One 2 hour exam, two project reports, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Coastal Management is about how scientific knowledge is used to support policy formulation and planning decisions in coastal environments. The course links coastal science to policy and practice in management of estuaries, beaches and the coastal ocean. The principles are exemplified through specific issues, such as coastal erosion, pollution, and impacts of climate-change. The issues are dealt with in terms of how things work in nature, and how the issues are handled through administrative mechanisms. These mechanisms involve planning strategies like Marine Protected Areas and setback limits on civil development in the coastal zone. The coastal environments and processes that are more relevant to coastal management including: rocky coasts; beaches, barriers and dunes; and coral reefs will also be introduced. At a practical level, the link between science and coastal management is given substance through development and use of 'decision-support models'. These models involve geocomputing methods that entail application of simulation models, remotely sensed information, and Geographic Information Systems (GIS). The course therefore includes both principles and experience in use of these methods to address coastal-management issues. (It thus also involves extensive use of computers.) Although the focus is on the coast, the principles and methods have broader relevance to environmental management in particular, and to problem-solving in general. That is, the course has vocational relevance in examining how science can be exploited to the benefit of society and nature conservation.

GEOS3914
GIS in Coastal Management (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Eleanor Bruce **Session:** Semester 2 **Classes:** Two hours of lectures, one 3 hour practical per week comprising one 1 hour practical demonstration and one 2 hour practical **Prerequisites:** Distinction average in either 12 credit points of Intermediate Geoscience units or [(GEOS2115 or GEOS2915) and (BIOL2018 or BIOL2918 or BIOL2024 or BIOL2924 or BIOL2028 or BIOL2928)]. **Prohibitions:** GEOS3014 or MARS3104 **Assessment:** One 2 hour exam, project work, two practical-based project reports, fortnightly progress quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: A distinction average in prior Geography, Geology or Marine Science units of study is normally required for admission. This requirement may be varied and students should consult the unit of study coordinator.

Advanced students will complete the same core lecture material as for GEOS3014 but will carry out more challenging projects, practicals, assignments and tutorials.

GEOS3103
Environmental and Sedimentary Geology

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3803 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical reports and quizes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Sediments and sedimentary rocks cover most of the Earth's surface, record much of the Earth's geological and climatic history and host important resources such as petroleum, coal, water and mineral ores. The aim of this unit is to provide students with the skills required to examine, describe and interpret sediments and sedimentary rocks for a variety of different purposes. Specific foci of the unit will be the identification of the recent or ancient environment in which sedimentary materials were deposited, the environmental controls which produce sedimentary structures, and the processes that control the production, movement and storage of sediment bodies. On completion of this unit students will be familiar with the natural processes that produce and modify sediments across a range of environments at the Earth's surface, including fluvial, aeolian, lacustrine, marginal marine and deep marine environments. The various controls on the sedimentary record such as climate and sea-level change, as well as diagenesis and geochemical cycles will also be discussed. Practical exercises will require students to examine global datasets, and determine the properties and significance of sediments and sedimentary rocks. The course is relevant to students interested in petroleum or mineral exploration, environmental and engineering geology as well as marine geoscience.

Textbooks

Course notes will be available from the Copy Centre and an appropriate set of reference texts will be placed on special reserve in the library.

GEOS3803
Environmental and Sedimentary Geology(Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Dan Penny (Coordinator), Dr. Adriana Dutkiewicz **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3103 **Assumed knowledge:** (GEOS1003 or GEOS1903) **Assessment:** One 2 hour exam, practical, field reports and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3103 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independent work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Textbooks

Course notes will be available from the Copy Centre and appropriate set of reference texts will be placed on special reserve in the library.

GEOS3104
Geophysical Methods

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Muller (co-ordinator), A/Prof Patrice Rey, Dr Tristan Salles, Dr Gilles Brocard **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour practical class per week. **Prerequisites:** (GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924) **Prohibitions:** GEOS3804 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 or GEOS3004 **Assessment:** One 2 hour exam (50%), practical work (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces the common geophysical methods used to investigate the interior and dynamics of the Earth and focuses on the techniques used for mineral and hydrocarbon exploration. On completion of this unit students will have developed a thorough understanding of the common geophysical methods utilised in industry and academia. They will be able to evaluate and critically assess most forms of geophysical data as well as actively participate in geophysical exploration. The course will provide the students with the computational skills to process different types of geophysical data and link them to simulations of Earth processes through time, especially focussing on linking deep Earth and surface processes, such as subsidence/uplift and erosion/sedimentation. The unit is aimed at students with interests in land-based and marine exploration, plate tectonics, internal earth structure/dynamics, and near-surface investigations of groundwater resources and environmental pollution. Students wishing to specialise in the field and become professional geophysicists will need to expand upon the geophysics knowledge gained from this unit and either complete an honours project or progress to postgraduate coursework in this field.

GEOS3804
Geophysical Methods (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Dietmar Müller (co-ordinator), A/Prof Patrice Rey, Dr Tristan Salles, Dr Gilles Brocard **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 3 hour practical class per week. **Prerequisites:** A mark of 75 or above in [(GEOS2114 or GEOS2914) and (GEOS2124 or GEOS2924)] **Prohibitions:** GEOS3104 or GEOS3003 or GEOS3006 or GEOS3016 or GEOS3017 or GEOS3903 or GEOS3906 or GEOS3916 or GEOS3917 **Assessment:** One 2 hour exam, practical work (100%) **Practical field work:** Geophysical Field Prac (details to be announced) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students who have a credit average for all Geoscience units may enrol in this unit with the permission of the Head of School.

This unit has the same objectives as GEOS3104 and is suitable for students who wish to pursue aspects of the subject in greater depth. Entry is restricted and selection is made from the applicants on the basis of their performance at the time of enrolment. Students who elect to take this unit will participate in alternatives to some aspects of the standard unit and will be required to pursue independant work to meet unit objectives. Specific details for this unit of study will be announced in meetings with students in week 1 of semester.

Table 1: Mathematics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Mathematics			
For a major in Mathematics, the minimum requirement is 24 credit points from senior units of study listed in this subject area.			
Junior units of study			
Introductory level			
MATH1111 **Introduction to Calculus**	6	**A** HSC General Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1011 or MATH1901 or MATH1906 or MATH1001 or HSC Mathematics Extension 1 or HSC Mathematics Extension 2 or ENVX1001 or MATH1021 or MATH1921 or MATH1931 *Note: Department permission required for enrolment* *Students who have previously successfully studied calculus at a level at least equivalent to HSC Mathematics are prohibited.*	Semester 1
Fundamental level			
MATH1011 **Applications of Calculus**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1001 or MATH1901 or MATH1906 or MATH1111 or BIOM1003 or ENVX1001 or MATH1021 or MATH1921 or MATH1931	Semester 1 Summer Main
MATH1013 **Mathematical Modelling**	3	**A** HSC Mathematics or a credit or higher in MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1003 or MATH1903 or MATH1907 or MATH1023 or MATH1923 or MATH1933	Semester 2 Summer Main
MATH1014 **Introduction to Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **N** MATH1012 or MATH1002 or MATH1902	Semester 2
MATH1015 **Biostatistics**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020	Semester 1
Regular level			
MATH1021 **Calculus Of One Variable**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931	Semester 1
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1012 or MATH1014 or MATH1902	Semester 1 Summer Main
MATH1023 **Multivariable Calculus and Modelling**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933	Semester 2
MATH1004 **Discrete Mathematics**	3	**A** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1904 or MATH1064 or MATH2011	Semester 2 Summer Main
MATH1005 **Statistical Thinking with Data**	3	**A** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **N** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020	Semester 2 Summer Main Winter Main
MATH1064 **Discrete Mathematics for Computation**	6	**N** MATH1004 or MATH1904	Semester 2
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **C** MATH1003 or MATH1903 **N** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001.	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 1 or MATH1001 or MATH1011 or a credit or higher in MATH1111. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1013 or MATH1903 or MATH1907	Summer Main

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Advanced level			
MATH1921 **Calculus Of One Variable (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 *Note: Department permission required for enrolment*	Semester 1
MATH1902 **Linear Algebra (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1002 or MATH1012 or MATH1014 *Note: Department permission required for enrolment*	Semester 1
MATH1923 **Multivariable Calculus and Modelling (Adv)**	3	**A** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **N** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 *Note: Department permission required for enrolment*	Semester 2
MATH1904 **Discrete Mathematics (Advanced)**	3	**A** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **N** MATH1004 or MATH1064 or MATH2011 *Note: Department permission required for enrolment*	Semester 2
MATH1905 **Statistical Thinking with Data (Advanced)**	3	**A** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **N** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 *Note: Department permission required for enrolment*	Semester 2
Special Studies level			
MATH1931 **Calculus Of One Variable (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 1
MATH1933 **Multivariable Calculus and Modelling (SSP)**	3	**A** Band E4 in HSC Mathematics Extension 2 or equivalent. **N** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 *Note: Department permission required for enrolment* *Enrolment is by invitation only.*	Semester 2
Intermediate units of study			
MATH2021 **Vector Calculus and Differential Equations**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1XX2) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) **N** MATH2921 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067	Semester 1
MATH2921 **Vector Calculus and Differential Eqs (Adv)**	6	**P** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **N** MATH2021 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067	Semester 1
MATH2022 **Linear and Abstract Algebra**	6	**P** MATH1XX2 **N** MATH2922 or MATH2968 or MATH2061 or MATH2961	Semester 1
MATH2922 **Linear and Abstract Algebra (Advanced)**	6	**P** MATH1902 or (a mark of 65 or above in MATH1002) **N** MATH2022 or MATH2968 or MATH2061 or MATH2961	Semester 1
MATH2023 **Analysis**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1XX2) **N** MATH2923 or MATH3068 or MATH2962	Semester 2
MATH2923 **Analysis (Advanced)**	6	**P** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **N** MATH2023 or MATH2962 or MATH3068	Semester 2
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** (MATH1X21 or MATH1011 or MATH1931 or MATH1X01 or MATH1906) and (MATH1014 or MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) **N** MATH2001 or MATH2901 or MATH2002 or MATH2902 or MATH2961 or MATH2067 or MATH2021 or MATH2921 or MATH2022 or MATH2922 *This unit of study is only available to Faculty of Engineering and Information Technologies students.*	Semester 1 Summer Main
MATH2065 **Partial Differential Equations (Intro)**	6	**P** (MATH1011 or MATH1001 or MATH1901 or MATH1906) and (MATH1014 or MATH1002 or MATH1902) and (MATH1003 or MATH1903 or MATH1907) **N** MATH2005 or MATH2905 or MATH2965 or MATH2067	Summer Main
MATH2068 **Number Theory and Cryptography**	6	**A** MATH1014 or MATH1002 or MATH1902 **P** 6 credit points of Junior Mathematics units **N** MATH2988 or MATH3009 or MATH3024	Semester 2
MATH2988 **Number Theory and Cryptography Advanced**	6	**P** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH19X3 or MATH1907 or (a mark of 65 or above in MATH1023 or MATH1003)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **N** MATH2068	Semester 2
MATH2069 **Discrete Mathematics and Graph Theory**	6	**P** 6 credit points of Junior Mathematics units **N** MATH2011 or MATH2009 or MATH2969	Semester 1
MATH2969 **Discrete Mathematics and Graph Theory Adv**	6	**P** 9 credit points of Junior Mathematics (advanced level or Credit at the normal level) **N** MATH2011 or MATH2009 or MATH2069	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MATH2070 **Optimisation and Financial Mathematics**	6	**A** MATH1X23 or MATH1933 or MATH1X03 or MATH1907 **P** (MATH1X21 or MATH1011 or MATH1931 or MATH1X01 or MATH1906) and (MATH1014 or MATH1X02) **N** MATH2010 or MATH2033 or MATH2933 or MATH2970 or ECMT3510 *Students may enrol in both MATH2070 and MATH3075 in the same semester*	Semester 2
MATH2970 **Optimisation and Financial Mathematics Adv**	6	**A** MATH19X3 or MATH1907 or a mark of 65 or above in MATH1003 or MATH1023 **P** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **N** MATH2010 or MATH2033 or MATH2933 or MATH2070 or ECMT3510 *Students may enrol in both MATH2970 and MATH3975 in the same semester*	Semester 2
MATH2916 **Working Seminar A (SSP)**	3	**P** High Distinction average over 12 credit points of Junior Advanced Mathematics *Note: Department permission required for enrolment*	Semester 1
MATH2917 **Working Seminar B (SSP)**	3	**P** High Distinction average over 12 credit points of Junior Advanced Mathematics *Note: Department permission required for enrolment*	Semester 2
Senior units of study			
MATH3061 **Geometry and Topology**	6	**P** 12 credit points of Intermediate Mathematics **N** MATH3001 or MATH3006	Semester 2
MATH3063 **Nonlinear ODEs with Applications**	6	**A** MATH2061 or [MATH2X21 and MATH2X22] **P** 12 credit points of Intermediate mathematics **N** MATH3003 or MATH3923 or MATH3020 or MATH3920 or MATH3963	Semester 1
MATH3963 **Nonlinear ODEs with Applications (Adv)**	6	**A** (MATH2961 or [MATH2921 and MATH2922]) and (MATH2962 or MATH2923) **P** 12 credit points of Intermediate mathematics **N** MATH3003 or MATH3923 or MATH3020 or MATH3920 or MATH3063	Semester 1
MATH3066 **Algebra and Logic**	6	**P** 6 credit points of Intermediate Mathematics **N** MATH3062 or MATH3065	Semester 1
MATH3068 **Analysis**	6	**P** 12 credit points of Intermediate Mathematics **N** MATH3008 or MATH2007 or MATH2907 or MATH2962	Semester 2
MATH3075 **Financial Mathematics**	6	**P** 12 credit points of Intermediate Mathematics, including (MATH2070 or MATH2970) **N** MATH3975 or MATH3015 or MATH3933	Semester 2
MATH3975 **Financial Mathematics (Advanced)**	6	**P** Credit average or greater in 12 credit points of Intermediate Mathematics (including MATH2070 or MATH2970) **N** MATH3933 or MATH3015 or MATH3075	Semester 2
MATH3076 **Mathematical Computing**	6	**P** 12 credit points of MATH2XXX and 6 credit points from (MATH1021 or MATH1001 or MATH1023 or MATH1003 or MATH19X1 or MATH19X3 or MATH1906 or MATH1907) **N** MATH3976 or MATH3016 or MATH3916	Semester 1
MATH3976 **Mathematical Computing (Advanced)**	6	**P** 12 credit points of MATH2XXX and [6 credit points from (MATH1923 or MATH1903 or MATH1933 or MATH1907), or a mark of 65 or above in (MATH1023 or MATH1003)] **N** MATH3076 or MATH3016 or MATH3916	Semester 1
MATH3078 **PDEs and Waves**	6	**A** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **P** 12 credit points of Intermediate Mathematics **N** MATH3018 or MATH3921 or MATH3978	Semester 2
MATH3978 **PDEs and Waves (Advanced)**	6	**A** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3078 or MATH3018 or MATH3921	Semester 2
MATH3961 **Metric Spaces (Advanced)**	6	**A** MATH2923 or MATH2962 **P** Credit average or greater in 12 credit points of Intermediate Mathematics units **N** MATH3001 or MATH3901	Semester 1
MATH3962 **Rings, Fields and Galois Theory (Adv)**	6	**A** MATH2922 or MATH2961 **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3062 or MATH3902 or MATH3002 *Students are advised to take MATH2968 before attempting this unit.*	Semester 1
MATH3968 **Differential Geometry (Advanced)**	6	**A** At least 6 credit points of Intermediate Advanced Mathematics or Senior Advanced Mathematics units **P** A mark of 65 or above in MATH2961 or MATH2921 **N** MATH3903	Semester 2
MATH3969 **Measure Theory and Fourier Analysis (Adv)**	6	**A** At least 6 credit points of (Intermediate Advanced Mathematics or Senior Advanced Mathematics units) **P** Credit average or greater in 12 credit points Intermediate Mathematics **N** MATH3909	Semester 2
MATH3974 **Fluid Dynamics (Advanced)**	6	**A** [MATH2961 and MATH2965] or [MATH2921 and MATH2922] **P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH3914	Semester 1
MATH3977 **Lagrangian and Hamiltonian Dynamics (Adv)**	6	**P** Credit average or greater in 12 credit points of Intermediate Mathematics **N** MATH2904 or MATH2004 or MATH3917	Semester 2

Mathematics

For a major in Mathematics, the minimum requirement is 24 credit points from senior units of study listed in this subject area.

Junior units of study

Introductory level

MATH1111
Introduction to Calculus

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1-hour lectures and two 1-hour tutorials per week. **Prohibitions:** MATH1011 or MATH1901 or MATH1906 or MATH1001 or HSC Mathematics Extension 1 or HSC Mathematics Extension 2 or ENVX1001 or MATH1021 or MATH1921 or MATH1931 **Assumed knowledge:** HSC General Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the

Mathematics Bridging Course (offered in February). **Assessment:** One 2-hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Students who have previously successfully studied calculus at a level at least equivalent to HSC Mathematics are prohibited.

This unit is an introduction to the calculus of one variable. Topics covered include elementary functions, differentiation, basic integration techniques and coordinate geometry in three dimensions. Applications in science and engineering are emphasised.

Textbooks

As set out in the Junior Mathematics Handbook

Fundamental level

MATH1011
Applications of Calculus

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1001 or MATH1901 or MATH1906 or MATH1111 or BIOM1003 or ENVX1001 or MATH1021 or MATH1921 or MATH1931 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed for science students who do not intend to undertake higher year mathematics and statistics. It establishes and reinforces the fundamentals of calculus, illustrated where possible with context and applications. Specifically, it demonstrates the use of (differential) calculus in solving optimisation problems and of (integral) calculus in measuring how a system accumulates over time. Topics studied include the fitting of data to various functions, the interpretation and manipulation of periodic functions and the evaluation of commonly occurring summations. Differential calculus is extended to functions of two variables and integration techniques include integration by substitution and the evaluation of integrals of infinite type.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1013
Mathematical Modelling

Credit points: 3 **Session:** Semester 2, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1003 or MATH1903 or MATH1907 or MATH1023 or MATH1923 or MATH1933 **Assumed knowledge:** HSC Mathematics or a credit or higher in MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1013 is designed for science students who do not intend to undertake higher year mathematics and statistics.

In this unit of study students learn how to construct, interpret and solve simple differential equations and recurrence relations. Specific techniques include separation of variables, partial fractions and first and second order linear equations with constant coefficients. Students are also shown how to iteratively improve approximate numerical solutions to equations.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1014
Introduction to Linear Algebra

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1002 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics. **Assessment:** One 1.5 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an introduction to Linear Algebra. Topics covered include vectors, systems of linear equations, matrices, eigenvalues and eigenvectors. Applications in life and technological sciences are emphasised.

Textbooks

As set out in the Junior Mathematics Handbook.

MATH1015
Biostatistics

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or BIOM1003 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1015 is designed to provide a thorough preparation in statistics for students in the Biological and Medical Sciences. It offers a comprehensive introduction to data analysis, probability and sampling, inference including t-tests, confidence intervals and chi-squared goodness of fit tests.

Textbooks

As set out in the Junior Mathematics Handbook

Regular level

MATH1021
Calculus Of One Variable

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001 or MATH1001 or MATH1921 or MATH1931 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals.

Textbooks

As set out in the Junior Mathematics Handbook.

MATH1002
Linear Algebra

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1012 or MATH1014 or MATH1902 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1002 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.

This unit of study introduces vectors and vector algebra, linear algebra including solutions of linear systems, matrices, determinants, eigenvalues and eigenvectors.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1023
Multivariable Calculus and Modelling

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr tutorial per week **Prohibitions:** MATH1013 or MATH1903 or MATH1907 or MATH1003 or MATH1923 or MATH1933 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1004
Discrete Mathematics

Credit points: 3 **Session:** Semester 2, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1904 or MATH1064 or MATH2011 **Assumed knowledge:** HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1004 is designed to provide a thorough preparation for further study in Mathematics.

This unit provides an introduction to fundamental aspects of discrete mathematics, which deals with 'things that come in chunks that can be counted'. It focuses on the enumeration of a set of numbers, viz. Catalan numbers. Topics include sets and functions, counting principles, discrete probability, Boolean expressions, mathematical induction, linear recurrence relations, graphs and trees.

Textbooks
As set out in the Junior Mathematics Handbook

MATH1005
Statistical Thinking with Data

Credit points: 3 **Session:** Semester 2, Summer Main, Winter Main **Classes:** Lectures 2 hrs/week; Practical 1 hr/week **Prohibitions:** MATH1015 or MATH1905 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** HSC Mathematics. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

In a data-rich world, global citizens need to problem solve with data, and evidence based decision-making is essential is every field of research and work.

This unit equips you with the foundational statistical thinking to become a critical consumer of data. You will learn to think analytically about data and to evaluate the validity and accuracy of any conclusions drawn. Focusing on statistical literacy, the unit covers foundational statistical concepts, including the design of experiments, exploratory data analysis, sampling and tests of significance.

Textbooks
Freedman, Pisani and Purves, Statistics, Norton, 2007

MATH1064
Discrete Mathematics for Computation

Credit points: 6 **Session:** Semester 2 **Classes:** lecture 3 hrs/week; tutorial 1 hr/week; prac class 1hr/week **Prohibitions:** MATH1004 or MATH1904 **Assessment:** assignment, quizzes, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces students to the language and key methods of the area of Discrete Mathematics. The focus is on mathematical concepts in discrete mathematics and their applications, with an emphasis on computation. For instance, to specify a computational problem precisely one needs to give an abstract formulation using mathematical objects such as sets, functions, relations, orders, and sequences. In order to prove that a proposed solution is correct, one needs to apply the principles of mathematical logic, and to use proof techniques such as induction. To reason about the efficiency of an algorithm, one often needs to estimate the growth of functions or count the size of complex mathematical objects. This unit provides the necessary mathematical background for such applications of discrete mathematics. Students will be introduced to mathematical logic and proof techniques; sets, functions, relations, orders, and sequences; counting and discrete probability; asymptotic growth; and basic graph theory.

Textbooks
As set out in the Junior Mathematics Handbook.

MATH1001
Differential Calculus

Credit points: 3 **Session:** Semester 1, Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Corequisites:** MATH1003 or MATH1903 **Prohibitions:** MATH1011 or MATH1901 or MATH1906 or MATH1111 or ENVX1001. **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1001 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. This unit of study looks at complex numbers, functions of a single variable, limits and continuity, vector functions and functions of two variables. Differential calculus is extended to functions of two variables. Taylor's theorem as a higher order mean value theorem.

Textbooks
As set out in the Junior Mathematics Handbook.

MATH1003
Integral Calculus and Modelling

Credit points: 3 **Session:** Summer Main **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1013 or MATH1903 or MATH1907 **Assumed knowledge:** HSC Mathematics Extension 1 or MATH1001 or MATH1011 or a credit or higher in MATH1111. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

MATH1003 is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering.This unit of study first develops the idea of the definite integral from Riemann sums, leading to the Fundamental Theorem of Calculus. Various techniques of integration are considered, such as integration by parts.The second part is an introduction to the use of first and second order differential equations to model a variety of scientific phenomena.

Textbooks
As set out in the Junior Mathematics Handbook

Advanced level

MATH1921
Calculus Of One Variable (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1906 or MATH1111 or ENVX1001 or MATH1901 or MATH1021 or MATH1931 **Assumed**

knowledge: (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates differential calculus and integral calculus of one variable and the diverse applications of this theory. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include complex numbers, functions of a single variable, limits and continuity, differentiation, optimisation, Taylor polynomials, Taylor's Theorem, Taylor series, Riemann sums, and Riemann integrals. Additional theoretical topics included in this advanced unit include the Intermediate Value Theorem, Rolle's Theorem, and the Mean Value Theorem.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1902
Linear Algebra (Advanced)

Credit points: 3 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1002 or MATH1012 or MATH1014 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. It parallels the normal unit MATH1002 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1923
Multivariable Calculus and Modelling (Adv)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1013 or MATH1907 or MATH1903 or MATH1023 or MATH1933 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (Band E4 in HSC Mathematics Extension 1) or equivalent. **Assessment:** exam, quizzes, assignments **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Calculus is a discipline of mathematics that finds profound applications in science, engineering, and economics. This unit investigates multivariable differential calculus and modelling. Emphasis is given both to the theoretical and foundational aspects of the subject, as well as developing the valuable skill of applying the mathematical theory to solve practical problems. Topics covered in this unit of study include mathematical modelling, first order differential equations, second order differential equations, systems of linear equations, visualisation in 2 and 3 dimensions, partial derivatives, directional derivatives, the gradient vector, and optimisation for functions of more than one variable. Additional topics covered in this advanced unit of study include the use of diagonalisation of matrices to study systems of linear equation and optimisation problems, limits of functions of two or more variables, and the derivative of a function of two or more variables.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1904
Discrete Mathematics (Advanced)

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1004 or MATH1064 or MATH2011 **Assumed knowledge:** HSC Mathematics Extension 1. Students who have not completed HSC Extension 1 Mathematics (or equivalent) are strongly advised to take the Extension 1 Mathematics Bridging Course (offered in February). **Assessment:** exam, quizzes, assignments **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics. It parallels the normal unit MATH1004 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

MATH1905
Statistical Thinking with Data (Advanced)

Credit points: 3 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 1 hour tutorial per week. **Prohibitions:** MATH1005 or MATH1015 or STAT1021 or STAT1022 or ECMT1010 or ENVX1001 or ENVX1002 or BUSS1020 **Assumed knowledge:** (HSC Mathematics Extension 2) OR (90 or above in HSC Mathematics Extension 1) or equivalent **Assessment:** One 1.5 hour examination, assignments and quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is designed to provide a thorough preparation for further study in mathematics and statistics. It is a core unit of study providing three of the twelve credit points required by the Faculty of Science as well as a Junior level requirement in the Faculty of Engineering. This Advanced level unit of study parallels the normal unit MATH1005 but goes more deeply into the subject matter and requires more mathematical sophistication.

Textbooks

As set out in the Junior Mathematics Handbook

Special Studies level

MATH1931
Calculus Of One Variable (SSP)

Credit points: 3 **Session:** Semester 1 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1001 or MATH1011 or MATH1901 or MATH1111 or ENVX1001 or MATH1906 or MATH1021 or MATH1921 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1921 Calculus of One Variable (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

MATH1933
Multivariable Calculus and Modelling (SSP)

Credit points: 3 **Session:** Semester 2 **Classes:** 2x1-hr lectures; 1x1-hr seminar; and 1x1-hr tutorial per week **Prohibitions:** MATH1003 or MATH1903 or MATH1013 or MATH1907 or MATH1023 or MATH1923 **Assumed knowledge:** Band E4 in HSC Mathematics Extension 2 or equivalent. **Assessment:** exam, quizzes, assignments, seminar participation **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment is by invitation only.

The Mathematics Special Studies Program is for students with exceptional mathematical aptitude, and requires outstanding performance in past mathematical studies. Students will cover the material of MATH1923 Multivariable Calculus and Modelling (Adv), and attend a weekly seminar covering special topics on available elsewhere in the Mathematics and Statistics program.

Intermediate units of study

MATH2021
Vector Calculus and Differential Equations

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1XX2) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) **Prohibitions:** MATH2921 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067 **Assessment:** assessment for this unit consists of quizzes, assignments, and a final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit opens with topics from vector calculus, including vector-valued functions (parametrised curves and surfaces; vector fields; div, grad and curl; gradient fields and potential functions), line integrals (arc length; work; path-independent integrals and conservative fields; flux across a curve), iterated integrals (double and triple integrals, polar, cylindrical and spherical coordinates; areas, volumes and mass; Green's Theorem), flux integrals (flow through a surface; flux integrals through a surface defined by a function of two variables, through cylinders, spheres and other parametrised surfaces), Gauss' and Stokes' theorems. The unit then moves to topics in solution techniques for ordinary and partial differential equations (ODEs and PDEs) with applications. It provides a basic grounding in these techniques to enable students to build on the concepts in their subsequent courses. The main topics are: second order ODEs (including inhomogeneous equations), higher order ODEs and systems of first order equations, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series).

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2921
Vector Calculus and Differential Eqs (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **Prohibitions:** MATH2021 or MATH2065 or MATH2965 or MATH2061 or MATH2961 or MATH2067 **Assessment:** assessment for this unit consists of quizzes, assignments, and a final exam. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is the advanced version of MATH2021, with more emphasis on the underlying concepts and mathematical rigour. The vector calculus component of the course will include: parametrised curves and surfaces, vector fields, div, grad and curl, gradient fields and potential functions, lagrange multipliers line integrals, arc length, work, path-independent integrals, and conservative fields, flux across a curve, double and triple integrals, change of variable formulas, polar, cylindrical and spherical coordinates, areas, volumes and mass, flux integrals, and Green's Gauss' and Stokes' theorems. The Differential Equations half of the course will focus on ordinary and partial differential equations (ODEs and PDEs) with applications with more complexity and depth. The main topics are: second order ODEs (including inhomogeneous equations), series solutions near a regular point, higher order ODEs and systems of first order equations, matrix equations and solutions, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, elementary Sturm-Liouville theory, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series). The unit then moves to topics in solution techniques for ordinary and partial differential equations (ODEs and PDEs) with applications. It provides a more thorough grounding in these techniques to enable students to build on the concepts in their subsequent courses. The main topics are: second order ODEs (including inhomogeneous equations), higher order ODEs and systems of first order equations, solution methods (variation of parameters, undetermined coefficients) the Laplace and Fourier Transform, an introduction to PDEs, and first methods of solutions (including separation of variables, and Fourier Series).

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2022
Linear and Abstract Algebra

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** MATH1XX2 **Prohibitions:** MATH2922 or MATH2968 or MATH2061 or MATH2961 **Assessment:** quizzes, assignments and final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Linear and abstract algebra is one of the cornerstones of mathematics and it is at the heart of many applications of mathematics and statistics in the sciences and engineering. This unit investigates and explores properties of linear functions, developing general principles relating to the solution sets of homogeneous and inhomogeneous linear equations, including differential equations. Linear independence is introduced as a way of understanding and solving linear systems of arbitrary dimension. Linear operators on real spaces are investigated, paying particular attention to the geometrical significance of eigenvalues and eigenvectors, extending ideas from first year linear algebra. To better understand symmetry, matrix and permutation groups are introduced and used to motivate the study of abstract group theory.

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2922
Linear and Abstract Algebra (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1-hr lectures; 1x1-hr tutorial; and 1x1-hr practice class per week **Prerequisites:** MATH1902 or (a mark of 65 or above in MATH1002) **Prohibitions:** MATH2022 or MATH2968 or MATH2061 or MATH2961 **Assessment:** quizzes, assignments and final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Linear and abstract algebra is one of the cornerstones of mathematics and it is at the heart of many applications of mathematics and statistics in the sciences and engineering. This unit is an advanced version of MATH2022, with more emphasis on the underlying concepts and on mathematical rigour. This unit investigates and explores properties of vector spaces, matrices and linear transformations, developing general principles relating to the solution sets of homogeneous and inhomogeneous linear equations, including differential equations. Linear independence is introduced as a way of understanding and solving linear systems of arbitrary dimension. Linear operators on real spaces are investigated, paying particular attention to the geometrical significance of eigenvalues and eigenvectors, extending ideas from first year linear algebra. To better understand symmetry, matrix and permutation groups are introduced and used to motivate the study of abstract group theory. The unit culminates in studying inner spaces, quadratic forms and normal forms of matrices together with their applications to problems both in mathematics and in the sciences and engineering.

Textbooks
As set out in the Intermediate Mathematics Handbook

MATH2023
Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** lecture 3hrs/week; practice class 1hr/week; tutorial 1hr/week **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1XX2) **Prohibitions:** MATH2923 or MATH3068 or MATH2962 **Assessment:** assessment for this unit consists of quizzes, an assignment, and a final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Analysis grew out of calculus, which leads to the study of limits of functions, sequences and series. It is one of the fundamental topics underlying much of mathematics including differential equations, dynamical systems, differential geometry, topology and Fourier analysis. This unit introduces the field of mathematical analysis both with a careful theoretical framework as well as selected applications.

It shows the utility of abstract concepts and teaches an understanding and construction of proofs in mathematics. This unit will be useful to students of mathematics, science and engineering and in particular to future school mathematics teachers, because we shall explain why common practices in the use of calculus are correct, and understanding this is important for correct applications and explanations. The unit starts with the foundations of calculus and the real numbers system. It goes on to study the limiting behaviour of sequences and series of real and complex numbers. This leads naturally to the study of functions defined as limits and to the notion of uniform convergence. Returning to the beginnings of calculus and power series expansions leads to complex variable theory: elementary functions of complex variable, the Cauchy integral theorem, Cauchy integral formula, residues and related topics with applications to real integrals.

Textbooks

As set out in the Intermediate Mathematics Handbook

MATH2923
Analysis (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** lecture 3hrs/week; practice class 1hr/week; tutorial 1hr/week **Prerequisites:** [(MATH1921 or MATH1931 or MATH1901 or MATH1906) or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] and [(MATH1923 or MATH1933 or MATH1903 or MATH1907) or (a mark of 65 or above in MATH1023 or MATH1003)] **Prohibitions:** MATH2023 or MATH2962 or MATH3068 **Assessment:** assessment for this unit consists of quizzes, an assignment, and a final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Analysis grew out of calculus, which leads to the study of limits of functions, sequences and series. It is one of the fundamental topics underlying much of mathematics including differential equations, dynamical systems, differential geometry, topology and Fourier analysis. This advanced unit introduces the field of mathematical analysis both with a careful theoretical frame- work as well as selected applications. It shows the utility of abstract concepts and teaches an understanding and construction of proofs in mathematics. This unit will be useful to students with more mathematical maturity who study mathematics, science, or engineering. The unit starts with the foundations of calculus and the real numbers system, with more emphasis on the topology. It goes on to study the limiting behaviour of sequences and series of real and complex numbers. This leads naturally to the study of functions defined as limits and to the notion of uniform con- vergence. Returning to the beginnings of calculus and power series expansions leads to complex variable theory: elementary functions of complex variable, the Cauchy integral theorem, Cauchy integral formula, residues and related topics with applications to real integrals.

Textbooks

As set out in the Intermediate Mathematics Handbook

MATH2061
Linear Mathematics and Vector Calculus

Credit points: 6 **Session:** Semester 1, Summer Main **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour practice class per week. **Prerequisites:** (MATH1X21 or MATH1011 or MATH1931 or MATH1X01 or MATH1906) and (MATH1014 or MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) **Prohibitions:** MATH2001 or MATH2901 or MATH2002 or MATH2902 or MATH2961 or MATH2067 or MATH2021 or MATH2921 or MATH2022 or MATH2922 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit of study is only available to Faculty of Engineering and Information Technologies students.

This unit starts with an investigation of linearity: linear functions, general principles relating to the solution sets of homogeneous and inhomogeneous linear equations (including differential equations), linear independence and the dimension of a linear space. The study of eigenvalues and eigenvectors, begun in junior level linear algebra, is extended and developed. The unit then moves on to topics from vector calculus, including vector-valued functions (parametrised curves and surfaces; vector fields; div, grad and curl; gradient fields and potential functions), line integrals (arc length; work; path-independent integrals and conservative fields; flux across a curve), iterated integrals (double and triple integrals; polar, cylindrical and spherical coordinates; areas, volumes and mass; Green's Theorem), flux integrals (flow through a surface; flux integrals through a surface defined by a function of two variables, though cylinders, spheres and parametrised surfaces), Gauss' Divergence Theorem and Stokes' Theorem.

MATH2065
Partial Differential Equations (Intro)

Credit points: 6 **Session:** Summer Main **Classes:** Three 1 hour lectures, one 1 hour tutorial, one 1 hour example class per week. **Prerequisites:** (MATH1011 or MATH1001 or MATH1901 or MATH1906) and (MATH1014 or MATH1002 or MATH1902) and (MATH1003 or MATH1903 or MATH1907) **Prohibitions:** MATH2005 or MATH2905 or MATH2965 or MATH2067 **Assessment:** 2 hour exam, mid-semester test, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is an introductory course in the analytical solutions of PDEs (partial differential equations) and boundary value problems. The techniques covered include separation of variables, Fourier series, Fourier transforms and Laplace transforms.

MATH2068
Number Theory and Cryptography

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** 6 credit points of Junior Mathematics units **Prohibitions:** MATH2988 or MATH3009 or MATH3024 **Assumed knowledge:** MATH1014 or MATH1002 or MATH1902 **Assessment:** 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cryptography is the branch of mathematics that provides the techniques for confidential exchange of information sent via possibly insecure channels. This unit introduces the tools from elementary number theory that are needed to understand the mathematics underlying the most commonly used modern public key cryptosystems. Topics include the Euclidean Algorithm, Fermat's Little Theorem, the Chinese Remainder Theorem, Möbius Inversion, the RSA Cryptosystem, the Elgamal Cryptosystem and the Diffie-Hellman Protocol. Issues of computational complexity are also discussed.

MATH2988
Number Theory and Cryptography Advanced

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH19X3 or MATH1907 or (a mark of 65 or above in MATH1023 or MATH1003)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **Prohibitions:** MATH2068 **Assessment:** One 2 hr exam, homework assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is an advanced version of MATH2068, sharing the same lectures but with more advanced topics introduced in the tutorials and computer laboratory sessions.

MATH2069
Discrete Mathematics and Graph Theory

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour practice class per week. **Prerequisites:** 6 credit points of Junior Mathematics units **Prohibitions:** MATH2011 or MATH2009 or MATH2969 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces students to several related areas of discrete mathematics, which serve their interests for further study in pure and applied mathematics, computer science and engineering. Topics to be covered in the first part of the unit include recursion and induction, generating functions and recurrences, combinatorics. Topics covered in the second part of the unit include Eulerian and Hamiltonian graphs, the theory of trees (used in the study of data structures), planar graphs, the study of chromatic polynomials (important in scheduling problems).

MATH2969

Discrete Mathematics and Graph Theory Adv

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour practice class per week. **Prerequisites:** 9 credit points of Junior Mathematics (advanced level or Credit at the normal level) **Prohibitions:** MATH2011 or MATH2009 or MATH2069 **Assessment:** One 2-hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will cover the same material as MATH2069 with some extensions and additional topics.

MATH2070

Optimisation and Financial Mathematics

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** (MATH1X21 or MATH1011 or MATH1931 or MATH1X01 or MATH1906) and (MATH1014 or MATH1X02) **Prohibitions:** MATH2010 or MATH2033 or MATH2933 or MATH2970 or ECMT3510 **Assumed knowledge:** MATH1X23 or MATH1933 or MATH1X03 or MATH1907 **Assessment:** One 2 hour exam, assignments, quiz, project (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students may enrol in both MATH2070 and MATH3075 in the same semester

Problems in industry and commerce often involve maximising profits or minimising costs subject to constraints arising from resource limitations. The first part of this unit looks at programming problems and their solution using the simplex algorithm; nonlinear optimisation and the Kuhn Tucker conditions.

The second part of the unit deals with utility theory and modern portfolio theory. Topics covered include: pricing under the principles of expected return and expected utility; mean-variance Markowitz portfolio theory, the Capital Asset Pricing Model, log-optimal portfolios and the Kelly criterion; dynamical programming. Some understanding of probability theory including distributions and expectations is required in this part.

Theory developed in lectures will be complemented by computer laboratory sessions using MATLAB. Minimal computing experience will be required.

MATH2970

Optimisation and Financial Mathematics Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week (lectures given in common with MATH2070). **Prerequisites:** [MATH19X1 or MATH1906 or (a mark of 65 or above in MATH1021 or MATH1001)] and [MATH1902 or (a mark of 65 or above in MATH1002)] **Prohibitions:** MATH2010 or MATH2033 or MATH2933 or MATH2070 or ECMT3510 **Assumed knowledge:** MATH19X3 or MATH1907 or a mark of 65 or above in MATH1003 or MATH1023 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students may enrol in both MATH2970 and MATH3975 in the same semester

The content of this unit of study parallels that of MATH2070, but students enrolled at Advanced level will undertake more advanced problem solving and assessment tasks, and some additional topics may be included.

MATH2916

Working Seminar A (SSP)

Credit points: 3 **Session:** Semester 1 **Classes:** One 1 hour seminar per week. **Prerequisites:** High Distinction average over 12 credit points of Junior Advanced Mathematics **Assessment:** One 1 hour presentation, 15-20 page essay (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The main aim of this unit is to develop the students' written and oral presentation skills. The material will consist of a series of connected topics relevant to modern mathematics and statistics. The topics are chosen to suit the students' background and interests, and are not covered by other mathematics or statistics units. The first session will be an introduction on the principles of written and oral presentation of mathematics. Under the supervision and advice of the lecturer(s) in charge, the students present the topics to the other students and the lecturer in a seminar series and a written essay in a manner that reflects the practice of research in mathematics and statistics.

MATH2917

Working Seminar B (SSP)

Credit points: 3 **Session:** Semester 2 **Classes:** One 1 hour seminar per week. **Prerequisites:** High Distinction average over 12 credit points of Junior Advanced Mathematics **Assessment:** One 1 hour presentation, 15-20 page essay (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The main aim of this unit is to develop the students' written and oral presentation skills. The material will consist of a series of connected topics relevant to modern mathematics and statistics. The topics are chosen to suit the students' background and interests, and are not covered by other mathematics or statistics units. The first session will be an introduction on the principles of written and oral presentation of mathematics. Under the supervision and advice of the lecturer(s) in charge, the students present the topics to the other students and the lecturer in a seminar series and a written essay in a manner that reflects the practice of research in mathematics and statistics.

Senior units of study

MATH3061

Geometry and Topology

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3001 or MATH3006 **Assessment:** One 2 hour exam, tutorial tests, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of the unit is to expand visual/geometric ways of thinking. The geometry section is concerned mainly with transformations of the Euclidean plane (that is, bijections from the plane to itself), with a focus on the study of isometries (proving the classification theorem for transformations which preserve distances between points), symmetries (including the classification of frieze groups) and affine transformations (transformations which map lines to lines). The basic approach is via vectors and matrices, emphasising the interplay between geometry and linear algebra. The study of affine transformations is then extended to the study of collineations in the real projective plane, including collineations which map conics to conics. The topology section considers graphs, surfaces and knots from a combinatorial point of view. Key ideas such as homeomorphism, subdivision, cutting and pasting and the Euler invariant are introduced first for graphs (1-dimensional objects) and then for triangulated surfaces (2-dimensional objects). Topics include the classification of surfaces, map colouring, decomposition of knots and knot invariants.

MATH3063

Nonlinear ODEs with Applications

Credit points: 6 **Teacher/Coordinator:** Prof Leon Poladian **Session:** Semester 1 **Classes:** Three lectures, one tutorial per week **Prerequisites:** 12 credit points of Intermediate mathematics **Prohibitions:** MATH3003 or MATH3923 or MATH3020 or MATH3920 or MATH3963 **Assumed knowledge:** MATH2061 or [MATH2X21 and MATH2X22] **Assessment:** Class tests, Assignments, Final examination **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is an introduction to the theory of systems of ordinary differential equations. Such systems model many types of phenomena in engineering, biology and the physical sciences. The emphasis will not be on finding explicit solutions, but instead on the qualitative features of these systems, such as stability, instability and oscillatory behaviour. The aim is to develop a good geometrical intuition into the behaviour of solutions to such systems. Some background in linear algebra, and familiarity with concepts such as limits and continuity, will be assumed. The applications in this unit will be drawn from predator-prey systems, transmission of diseases, chemical reactions, beating of the heart and other equations and systems from mathematical biology.

MATH3963
Nonlinear ODEs with Applications (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Robert Marangell **Session:** Semester 1 **Classes:** Three lectures, one tutorial per week **Prerequisites:** 12 credit points of Intermediate mathematics **Prohibitions:** MATH3003 or MATH3923 or MATH3020 or MATH3920 or MATH3063 **Assumed knowledge:** (MATH2961 or [MATH2921 and MATH2922]) and (MATH2962 or MATH2923) **Assessment:** Class tests, Assignments, Final examination **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The theory of ordinary differential equations is a classical topic going back to Newton and Leibniz. It comprises a vast number of ideas and methods of different nature. The theory has many applications and stimulates new developments in almost all areas of mathematics. The emphasis is on qualitative analysis including phase-plane methods, bifurcation theory and the study of limit cycles. The more theoretical part includes existence and uniqueness theorems, linearisation, and analysis of asymptotic behaviour. The applications in this unit will be drawn from predator-prey systems, population models, chemical reactions, and other equations and systems from mathematical biology.

MATH3066
Algebra and Logic

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 6 credit points of Intermediate Mathematics **Prohibitions:** MATH3062 or MATH3065 **Assessment:** One 2 hour exam (60%), two assignments (15% each), peer review of each assignment (5% each). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study unifies and extends mathematical ideas and techniques that most participants will have met in their first and second years, and will be of general interest to all students of pure and applied mathematics. It combines algebra and logic to present and answer a number of related questions of fundamental importance in the development of mathematics, from ancient to modern times. Classical and novel arithmetics are introduced, unified and described abstractly using field and ring axioms and the language of field extensions. Applications are presented, in particular the unsolvability of the celebrated classical construction problems of the Greeks. Quotient rings are introduced, culminating in a construction of the real numbers, by factoring out rings of Cauchy sequences of rationals by the ideal of null sequences. Axiomatics are placed in the context of reasoning within first order logic and set theory.

The Propositional and Predicate Calculi are studied as model axiomatic systems in their own right, including sketches of proofs of consistency and completeness. The final part of the course introduces precise notions of computability and decidability, through abstract Turing machines, culminating in the unsolvability of the Halting Problem and the undecidability of First Order Logic.

MATH3068
Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3008 or MATH2007 or MATH2907 or MATH2962 **Assessment:** One 2 hour exam, tutorial tests, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Analysis grew out of calculus, which leads to the study of limits of functions, sequences and series. The aim of the unit is to present enduring beautiful and practical results that continue to justify and inspire the study of analysis. The unit starts with the foundations of calculus and the real number system. It goes on to study the limiting behaviour of sequences and series of real and complex numbers. This leads naturally to the study of functions defined as limits and to the notion of uniform convergence. Returning to the beginnings of calculus and power series expansions leads to complex variable theory: analytic functions, Taylor expansions and the Cauchy Integral Theorem.

Power series are not adequate to solve the problem of representing periodic phenomena such as wave motion. This requires Fourier theory, the expansion of functions as sums of sines and cosines. This unit deals with this theory, Parseval's identity, pointwise convergence theorems and applications.

The unit goes on to introduce Bernoulli numbers, Bernoulli polynomials, the Euler MacLaurin formula and applications, the gamma function and the Riemann zeta function. Lastly we return to the foundations of analysis, and study limits from the point of view of topology.

MATH3075
Financial Mathematics

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate Mathematics, including (MATH2070 or MATH2970) **Prohibitions:** MATH3975 or MATH3015 or MATH3933 **Assessment:** Two class quizzes and one 2 hour exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an introduction to the mathematical theory of modern finance. Topics include: notion of arbitrage, pricing riskless securities, risky securities, utility theory, fundamental theorems of asset pricing, complete markets, introduction to options, binomial option pricing model, discrete random walks, Brownian motion, derivation of the Black-Scholes option pricing model, extensions and introduction to pricing exotic options, credit derivatives. A strong background in mathematical statistics and partial differential equations is an advantage, but is not essential. Students completing this unit have been highly sought by the finance industry, which continues to need graduates with quantitative skills. The lectures in the Normal unit are held concurrently with those of the corresponding Advanced unit.

MATH3975
Financial Mathematics (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics (including MATH2070 or MATH2970) **Prohibitions:** MATH3933 or MATH3015 or MATH3075 **Assessment:** Two class quizzes and one 2 hour exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an introduction to the mathematical theory of modern finance. Topics include: notion of arbitrage, pricing riskless securities, risky securities, utility theory, fundamental theorems of asset pricing, complete markets, introduction to options, binomial option pricing model, discrete random walks, Brownian motion, derivation of the Black-Scholes option pricing model, extensions and introduction to pricing exotic options, credit derivatives. A strong background in mathematical statistics and partial differential equations is an advantage, but is not essential. Students completing this unit have been highly sought by the finance industry, which continues to need graduates with quantitative skills. Students enrolled in this unit at the Advanced level will be expected to undertake more challenging assessment tasks. The lectures in the Advanced unit are held concurrently with those of the corresponding Normal unit.

MATH3076
Mathematical Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour laboratory per week. **Prerequisites:** 12 credit points of MATH2XXX and 6 credit points from (MATH1021 or MATH1001 or MATH1023 or MATH1003 or MATH19X1 or MATH19X3 or MATH1906 or MATH1907) **Prohibitions:** MATH3976 or MATH3016 or MATH3916 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to Fortran 95/2003 programming and numerical methods. Topics covered include computer arithmetic and computational errors, systems of linear equations, interpolation and approximation, solution of nonlinear equations, quadrature, initial value problems for ordinary differential equations and boundary value problems.

MATH3976
Mathematical Computing (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of MATH2XXX and [6 credit points from (MATH1923 or MATH1903 or MATH1933 or MATH1907), or a mark of 65 or above in (MATH1023 or MATH1003)]

Prohibitions: MATH3076 or MATH3016 or MATH3916 **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

See entry for MATH3076 Mathematical Computing.

MATH3078
PDEs and Waves

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3018 or MATH3921 or MATH3978 **Assumed knowledge:** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **Assessment:** One 2 hour exam, assignments, quizzes (100%). To pass MATH3078/3978, students must achieve satisfactory performance in the in-semester assessment component. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces Sturm-Liouville eigenvalue problems and their role in finding solutions to boundary value problems. Analytical solutions of linear PDEs are found using separation of variables and integral transform methods. Three of the most important equations of mathematical physics - the wave equation, the diffusion (heat) equation and Laplace's equation - are treated, together with a range of applications. There is particular emphasis on wave phenomena, with an introduction to the theory of sound waves and water waves.

To pass MATH3078, students must achieve satisfactory performance in the in-semester assessment component in order to pass the unit of study.

MATH3978
PDEs and Waves (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3078 or MATH3018 or MATH3921 **Assumed knowledge:** [MATH2X61 and MATH2X65] or [MATH2X21 and MATH2X22] **Assessment:** One 2 hour exam, assignments, quizzes (100%). To pass MATH3078 or MATH3978, students must achieve satisfactory performance in the in-semester assessment component. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

As for MATH3078 PDEs and Waves but with more advanced problem solving and assessment tasks. Some additional topics may be included.

MATH3961
Metric Spaces (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics units **Prohibitions:** MATH3001 or MATH3901 **Assumed knowledge:** MATH2923 or MATH2962 **Assessment:** 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Topology, developed at the end of the 19th Century to investigate the subtle interaction of analysis and geometry, is now one of the basic disciplines of mathematics. A working knowledge of the language and concepts of topology is essential in fields as diverse as algebraic number theory and non-linear analysis. This unit develops the basic ideas of topology using the example of metric spaces to illustrate and motivate the general theory. Topics covered include: Metric spaces, convergence, completeness and the contraction mapping theorem; Metric topology, open and closed subsets; Topological spaces, subspaces, product spaces; Continuous mappings and homeomorphisms; Compact spaces; Connected spaces; Hausdorff spaces and normal spaces, Applications include the implicit function theorem, chaotic dynamical systems and an introduction to Hilbert spaces and abstract Fourier series.

MATH3962
Rings, Fields and Galois Theory (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3062 or MATH3902 or MATH3002 **Assumed knowledge:** MATH2922 or MATH2961 **Assessment:** One 2 hour exam, homework assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are advised to take MATH2968 before attempting this unit.

This unit of study investigates the modern mathematical theory that was originally developed for the purpose of studying polynomial equations. The philosophy is that it should be possible to factorize any polynomial into a product of linear factors by working over a "large enough" field (such as the field of all complex numbers). Viewed like this, the problem of solving polynomial equations leads naturally to the problem of understanding extensions of fields. This in turn leads into the area of mathematics known as Galois theory.

The basic theoretical tool needed for this program is the concept of a ring, which generalizes the concept of a field. The course begins with examples of rings, and associated concepts such as subrings, ring homomorphisms, ideals and quotient rings. These tools are then applied to study quotient rings of polynomial rings. The final part of the course deals with the basics of Galois theory, which gives a way of understanding field extensions.

MATH3968
Differential Geometry (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** A mark of 65 or above in MATH2961 or MATH2921 **Prohibitions:** MATH3903 **Assumed knowledge:** At least 6 credit points of Intermediate Advanced Mathematics or Senior Advanced Mathematics units **Assessment:** One 2 hour exam and 2 assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an introduction to Differential Geometry, one of the core pillars of modern mathematics. Using ideas from calculus of several variables, we develop the mathematical theory of geometrical objects such as curves, surfaces and their higher-dimensional analogues. Differential geometry also plays an important part in both classical and modern theoretical physics. The course aims to develop geometrical ideas such as curvature in the context of curves and surfaces in space, leading to the famous Gauss-Bonnet formula relating the curvature and topology of a surface.

MATH3969
Measure Theory and Fourier Analysis (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorials per week. **Prerequisites:** Credit average or greater in 12 credit points Intermediate Mathematics **Prohibitions:** MATH3909 **Assumed knowledge:** At least 6 credit points of (Intermediate Advanced Mathematics or Senior Advanced Mathematics units) **Assessment:** One 2 hour exam, assignments, quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Measure theory is the study of such fundamental ideas as length, area, volume, arc length and surface area. It is the basis for the integration theory used in advanced mathematics since it was developed by Henri Lebesgue in about 1900. Moreover, it is the basis for modern probability theory. The course starts by setting up measure theory and integration, establishing important results such as Fubini's Theorem and the Dominated Convergence Theorem which allow us to manipulate integrals. This is then applied to Fourier Analysis, and results such as the Inversion Formula and Plancherel's Theorem are derived. The Radon-Nikodyn Theorem provides a representation of measures in terms of a density. Probability theory is then discussed with topics including distributions and conditional expectation.

MATH3974
Fluid Dynamics (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH3914 **Assumed knowledge:** [MATH2961 and MATH2965] or [MATH2921 and MATH2922] **Assessment:** One 2 hour exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to fluid dynamics, starting with a description of the governing equations and the simplifications gained by using stream functions or potentials. It develops elementary theorems and tools, including Bernoulli's equation, the role of vorticity, the vorticity equation, Kelvin's circulation theorem, Helmholtz's theorem, and an introduction to the use of tensors. Topics covered include viscous flows, lubrication theory, boundary layers, potential theory, and complex variable methods for 2-D airfoils. The unit concludes with an introduction to hydrodynamic stability theory and the transition to turbulent flow.

MATH3977
Lagrangian and Hamiltonian Dynamics (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** Credit average or greater in 12 credit points of Intermediate Mathematics **Prohibitions:** MATH2904 or MATH2004 or MATH3917 **Assessment:** One 2 hour exam and assignments and/or quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides a comprehensive treatment of dynamical systems using the mathematically sophisticated framework of Lagrange and Hamilton. This formulation of classical mechanics generalizes elegantly to modern theories of relativity and quantum mechanics. The unit develops dynamical theory from the Principle of Least Action using the calculus of variations. Emphasis is placed on the relation between the symmetry and invariance properties of the Lagrangian and Hamiltonian functions and conservation laws. Coordinate and canonical transformations are introduced to make apparently complicated dynamical problems appear very simple. The unit will also explore connections between geometry and different physical theories beyond classical mechanics.

Students will be expected to solve fully dynamical systems of some complexity including planetary motion and to investigate stability using perturbation analysis. Hamilton-Jacobi theory will be used to elegantly solve problems ranging from geodesics (shortest path between two points) on curved surfaces to relativistic motion in the vicinity of black holes.

This unit is a useful preparation for units in dynamical systems and chaos, and complements units in differential equations, quantum theory and general relativity.

Table 1: Medicinal Chemistry

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Medicinal Chemistry			
For a major in Medicinal Chemistry, the minimum requirement is 24 credit points comprising: (i) PCOL3011/3911 and PCOL3012/3912; and (ii) CHEM3110/3910 and CHEM3115/3915. Note that there are intermediate prerequisites for the core senior units of study. Junior and intermediate units of study should be selected to permit progression to the required senior units of study.			
PCOL3011 **Toxicology**	6	**P** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **N** PCOL3911	Semester 1
PCOL3911 **Toxicology (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **N** PCOL3011	Semester 1
PCOL3012 **Drug Design and Development**	6	**P** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **N** PCOL3912	Semester 1
PCOL3912 **Drug Design and Development (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **N** PCOL3012	Semester 1
CHEM3110 **Biomolecules: Properties and Reactions**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3910	Semester 1
CHEM3910 **Biomolecules: Properties and Reactions Adv**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3110	Semester 1
CHEM3115 **Synthetic Medicinal Chemistry**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3915	Semester 2
CHEM3915 **Synthetic Medicinal Chemistry (Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3115	Semester 2

Medicinal Chemistry

For a major in Medicinal Chemistry, the minimum requirement is 24 credit points comprising:(i) PCOL3011/3911 and PCOL3012/3912; and(ii) CHEM3110/3910 and CHEM3115/3915.Note that there are intermediate prerequisites for the core senior units of study. Junior and intermediate units of study should be selected to permit progression to the required senior units of study.

PCOL3011
Toxicology

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every 2 weeks and two practical sessions each 3 hours in length. **Prerequisites:** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **Prohibitions:** PCOL3911 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the discipline of toxicology. The study of toxicology is central to the assessment of drug safety in drug development and in the explanation of toxicology associated with registered drugs (adverse drug reactions) and drug-drug interactions. These issues as well as the pharmacogenetic basis of adverse reactions will be considered. Environmental toxicology, particularly toxic reactions to environmental agents such as asbestos and pesticides, and target organ toxicology (lung, liver, CNS) are also covered. The diverse world of plants and animal toxins will also be explored. As a final consequence of exposure to many toxicants, the biology and causes of cancer are discussed. As part of the unit students are introduced to basic ideas about the collection and analysis of data from human and animal populations, both in the structured situation of clinical trials, forensic problems and in analysis of epidemiological data.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 2 ed. McGraw Hill. 2010, or, by the same authors: Toxicology: The Basic Science of Poisons. 7 ed. McGraw Hill. 2008.

PCOL3911
Toxicology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every second week. and two practical sessions each 3 hours in length **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **Prohibitions:** PCOL3011 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3011. Students will be set special advanced assignments and additional practical data management activities related to the material covered in lectures and practical work. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 3rd ed. McGraw Hill. 2015.. or, by the same authors: Toxicology: The Basic Science of Poisons. 8th ed. McGraw Hill. 2013.

PCOL3012
Drug Design and Development

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **Prohibitions:**

PCOL3912 **Assessment:** One 2 hour exam, class and online quizzes, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the field of medicinal chemistry associated with drug design and development. The course covers the fundamental aspects of drug discovery and development with reference to the essentials of chemistry and illustrates drug development with examples that include neuraminidase inhibitors and angiotensin converting enzyme inhibitors. The role of computers in drug design is emphasised by classwork and assignments on molecular modelling and structure-activity relationships. The course also extends to a section on the design of diverse pharmacological agents which include compounds for imaging by positron emission tomography (PET), and kinase inhibitors.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

PCOL3912
Drug Design and Development (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **Prohibitions:** PCOL3012 **Assessment:** One 2 hour exam, in class and online quizzes, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3012. Students will be set special advanced assignments related to the material covered in core areas. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

CHEM3110
Biomolecules: Properties and Reactions

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures and two 4-hour practicals per week for half of semester **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3910 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

DNA, proteins and carbohydrates represent three classes of essential biomolecules present in all biological systems. This unit will cover the structure, reactivity and properties of biomolecules and the building blocks from which these molecules are assembled. Interactions between biomolecules and metalions, small molecules and other biomolecules will be covered and the chemical tools for studying biomolecules highlighted. The design and synthesis of small molecules which mimic the functions of biomolecules will also be illustrated.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3910
Biomolecules: Properties and Reactions Adv

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3110 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

DNA, proteins and carbohydrates represent three classes of essential biomolecules present in all biological systems. This unit will cover the structure, reactivity and properties of biomolecules and the building blocks from which these molecules are assembled. Interactions between biomolecules and metal ions, small molecules and other biomolecules will be covered and the chemical tools for studying biomolecules highlighted. The design and synthesis of small molecules which mimic the functions of biomolecules will also be illustrated. CHEM3910 students attend the same lectures as CHEM3110 students but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3115
Synthetic Medicinal Chemistry

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and two 4-hour practicals per week for half of semester. **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3915 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The development of new pharmaceuticals fundamentally relies on the ability to design and synthesize new compounds. Synthesis is an enabling discipline for medicinal chemistry - without it, the development of new drugs cannot progress from design to implementation, and ultimately to a cure. This unit will tackle important factors in drug design, and will highlight the current arsenal of methods used in the discovery of new drugs, including rational drug design, high throughput screening and combinatorial chemistry. We will develop a logical approach to planning a synthesis of a particular target structure. The synthesis and chemistry of heterocycles, which comprise some 40% of all known organic compounds and are particularly common in pharmaceuticals, will be outlined. Examples will include important ring systems present in biological systems, such as pyrimidines and purines (DNA and RNA), imidazole and thiazole (amino acids and vitamins) and porphyrins (natural colouring substances and oxygen carrying component of blood). Throughout the course, the utility of synthesis in medicinal chemistry will be illustrated with case studies such as anti-influenza (Relenza), anaesthetic (benzocaine), anti-inflammatory (Vioxx), antihypertensive (pinacidil) and cholesterol-lowering (Lovastatin) drugs.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3915
Synthetic Medicinal Chemistry (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3115 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The development of new pharmaceuticals fundamentally relies on the ability to design and synthesize new compounds. Synthesis is an enabling discipline for medicinal chemistry - without it, the development of new drugs cannot progress from design to implementation, and ultimately to a cure. This unit will tackle important factors in drug design, and will highlight the current arsenal of methods used in the discovery of new drugs, including rational drug design, high throughput screening and combinatorial chemistry. We will develop a logical approach to planning a synthesis of a particular target structure. The synthesis and chemistry of heterocycles, which comprise some 40% of all known organic compounds and are particularly common in pharmaceuticals, will be outlined. Examples will include important ring systems present in biological systems, such as pyrimidines and purines (DNA and RNA), imidazole and thiazole (amino acids and vitamins) and porphyrins (natural colouring substances and oxygen carrying component of blood). Throughout the course, the utility of synthesis in medicinal chemistry will be illustrated with case studies such as anti-influenza (Relenza), anaesthetic (benzocaine), anti-inflammatory (Vioxx), antihypertensive (pinacidil) and cholesterol-lowering (Lovastatin) drugs. CHEM3915 students attend the same lectures as

CHEM3115 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

S e e http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

Table 1: Microbiology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Microbiology			
For a major in Microbiology, the minimum requirement is 24 credit points from senior units of study listed below.			
Intermediate units of study			
MICR2031 **Microbiology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **N** MICR2021 or MICR2921 or MICR2024 or MICR2931	Semester 1
MICR2931 **Microbiology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **P** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2021 or MICR2921 or MICR2024 or MICR2031	Semester 1
MICR2022 **Microbes in Society**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **N** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
MICR2922 **Microbes in Society (Advanced)**	6	**A** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **P** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **N** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *This unit is not available to BMedSc students. This unit is not offered from 2019.*	Semester 2
Senior units of study			
MICR3011 **Microbes in Infection**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **N** MICR3911 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
MICR3911 **Microbes in Infection (Advanced)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** MICR3011	Semester 1
MICR3032 **Cellular and Molecular Microbiology**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX) and MICR2X22] OR (BMED2401 and BMED2404) OR [12cp from (MICR2024 or MICR2X31 or GEGE2X01 or GENE2002)] **N** MICR3932 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3932 **Cellular and Molecular Microbiology (Adv)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in MICR2X22] OR [BMED2401 and BMED2404 and a mark of 75 or above in 6cp from (BMED2401 or BMED2404)] OR [6cp from (MICR2024 or MICR2X31) and a mark of 75 or above in 6cp from (GEGE2X01 or GENE2002)] **N** MICR3032 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3042 **Microbiology Research Skills**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** [6cp from (BIOL1XX7 or MBLGXXXX) and MICR2X22] OR (BMED2401 and BMED2404) OR [12cp from (MICR2024 or MICR2X31 or GEGE2X01 or GENE2002)] **N** MICR3942 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
MICR3942 **Microbiology Research Skills (Adv)**	6	**A** MICR2X21 or MICR2024 or MICR2X31 **P** 6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in MICR2X22] OR [BMED2401 and BMED2404 and a mark of 75 or above in 6cp from (BMED2401 or BMED2404)] OR [6cp from (MICR2024 or MICR2X31) and a mark of 75 or above in 6cp from (GEGE2X01 or GENE2002)] **N** MICR3022 or MICR3922 or MICR3042 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
VIRO3001 **Virology**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3901 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
VIRO3901 **Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms, biomolecules and ecosystems **P** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **N** VIRO3001 *Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
VIRO3002 **Medical and Applied Virology**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **N** VIRO3902 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.*	Semester 2
VIRO3902 **Medical and Applied Virology (Advanced)**	6	**A** Fundamental concepts of microorganisms and biomolecules **P** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **N** VIRO3002 *Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.*	Semester 2

Microbiology

For a major in Microbiology, the minimum requirement is 24 credit points from senior units of study listed below.

Intermediate units of study

MICR2031
Microbiology

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2931 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45-minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: one written assignment (15%), one group oral presentation (10%) and online quizzes (15%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the earth's trees. This unit of study will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require if you specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology or science education.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

MICR2931
Microbiology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Michael Kertesz **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; one 3-hour practical per week; three tutorial sessions **Prerequisites:** A mark of 70 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2021 or MICR2921 or MICR2024 or MICR2031 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems; CHEM1XX1 **Assessment:** Theory 60%: one 45 minute mid-semester theory exam (20%) and one 1.5-hour theory exam (40%); Practical 40%: two written assignments (10%, 15%), and online quizzes (15%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Microbes are essential for every aspect of life on the planet. Microbes in the human gut control our digestion and our immune system, microbes in the soil are required for plant growth, microbes in the ocean fix more carbon dioxide than all the Earth's trees. In this unit of study you will investigate the diversity and activity of microorganisms - viruses, bacteria, fungi, algae and protozoa - and look at how they interact with us, each other, plants and animals. You will examine how microbes underpin healthy ecosystems through nutrient cycling and biodegradation, their use industrially in biotechnology and food production, and their ability to cause harm, producing disease, poisoning, pollution and spoilage. Detailed aspects of microbial ecology, nutrition, physiology and genetics will also be introduced. This unit of study will provide you with the breadth of knowledge and skills needed for further studies of microbiology, and will provide the fundamental understanding of microbes that you will require to specialise in related fields such as biochemistry, molecular biology, immunology, agriculture, nutrition and food sciences, bioengineering and biotechnology, ecology, or science education. As an Advanced unit, MICR2931 provides increased challenge and academic rigour to develop a greater understanding and depth of disciplinary expertise. You will actively participate in a series of small group tutorials investigating the molecular detail of microbial communication and function, which will culminate in you creating a scientific research report that communicates your understanding of recent research in microbiology.

Textbooks

Willey et al, PrescottÂ¿s Microbiology, 10th edition, McGraw-Hill, 2017

MICR2022
Microbes in Society

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials per semester. Eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX **Prohibitions:** MICR2922 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, two assignments, one quiz, one practical exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

Pathogenic microbes cause infectious diseases of humans, animals and plants, and inflict enormous suffering and economic losses. Beneficial microbes are important contributors to food production, agriculture, biotechnology, and environmental processes. The aims of MICR2022/2922 are to explore the impacts and applications of microbes in human society and in the environment at large, and to teach skills and specialist knowledge in several key areas of microbiology. Medical Microbiology lectures will cover bacterial, viral, and fungal pathogens, and will introduce the concepts of epidemiology, transmission, pathogenicity, virulence factors, host/parasite relationships, host defences, prevention of disease, and antibiotic types, functions, and resistance. Lecture topics in other areas include Food (preservation, spoilage, poisoning, industrial context), Industrial (fermentation, traditional and recombinant products, bioprospecting), Environmental (nutrient cycles, atmosphere, wastewater, pollution, biodegradation) and Agricultural (nitrogen fixation, plant pathogens, biocontrol) microbiology. The laboratory sessions are integrated with the lecture series and are designed to give students practical experience in isolating, identifying and manipulating live potentially pathogenic microorganisms.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

MICR2922
Microbes in Society (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, plus an additional four 1-hour tutorials, three 1-hour seminars and eleven 3-hour practicals per semester **Prerequisites:** 6cp from (BIOL1XX7 or MBLG1XXX) and an additional 6cp from BIOL1XXX and a mark of 75 or above in 6cp from (BIOL1XXX or MBLG1XXX) **Prohibitions:** MICR2022 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** CHEM1XXX and (MICR2X21 or MICR2024 or MICR2X31) **Assessment:** Theory (60%): One 2-hour theory exam; Practical (40%): continuous assessment in practicals, one assignment, one quiz, one practical exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is not available to BMedSc students. This unit is not offered from 2019.

This unit of study is based on MICR2022. A science communication exercise is unique to MICR2922 and consists of three small group sessions exploring how recent advances in microbiology are communicated to the wider public. This advanced component replaces one assignment exercise from the practical class and is assessed as short essay. The content and nature of this component is based on recent publications with potential high impact for society.

Textbooks

Willey et al. Prescott's Microbiology. 10th edition. McGraw-Hill. 2016.

Senior units of study

MICR3011
Microbes in Infection

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and 6cp from MICR2X22] OR [BMED2401 and BMED2404] **Prohibitions:** MICR3911 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 2-hour exam; Practical (40%): case study: worksheet, lab work, presentation; one quiz; one 1-hour theory of prac exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The practical component is designed to enhance students' practical skills and to complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR et al. Medical Microbiology. 8th edition. Mosby. 2016.

MICR3911
Microbes in Infection (Advanced)

Credit points: 6 **Teacher/Coordinator:** Helen Agus **Session:** Semester 1 **Classes:** Two 1-hour lectures per week including six 1-hour tutorials, eight 3-hour practical sessions and three 2-hour clinical tutorials per semester. **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX or GEGE2X01 or GENE2002) and a mark of 75 or above in MICR2X22] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** MICR3011 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1.5-hour exam (45%), one essay, one in-semester exam; Practical (40%): case study: worksheet, lab work, presentation; quiz; one 1-hour theory of prac exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is available to students who have performed well in Intermediate Microbiology. This unit is designed to further develop an interest in, and understanding of, medical microbiology from the introduction in Intermediate Microbiology. Through an examination of microbial structure, virulence, body defences and pathogenesis, the process of acquisition and establishment of disease is covered. The unit is divided into three themes: 1. Clinical Microbiology: host defences, infections, virulence mechanisms; 2. Public health microbiology: epidemiology, international public health, transmission, water and food borne outbreaks; 3. Emerging and re-emerging diseases: the impact of societal change with respect to triggering new diseases and causing the re-emergence of past problems, which are illustrated using case studies. The unique aspect of this advanced unit that differentiates it from the mainstream unit is six tutorial style sessions that replace six mainstream lectures in the theme 'Emerging and re-emerging diseases'. These dedicated research-led interactive advanced sessions support self-directed learning and involve discussion around specific topics that will vary from year to year. Nominated research papers and reviews in the topic area will be explored with supported discussion of the relevance to and impact of the work on current thinking around emergence of microbial disease. The focus will be on microbial change that lies critically at the centre of understanding the reasons for the emergence of new diseases and challenges in an era of significant scientific ability to diagnose and treat infection. The practical component is identical to the mainstream unit and is designed to enhance students' practical skills and to complement the lectures. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Clinical tutorial sessions underpin and investigate the application of the material covered in the practical classes.

Textbooks

Murray PR.et al. Medical Microbiology. 8th ed., Mosby, 2016

MICR3032
Cellular and Molecular Microbiology

Credit points: 6 **Teacher/Coordinator:** Dr Nick Coleman **Session:** Semester 2 **Classes:** Three lectures per week and one 2-hour practical or tutorial per week **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and MICR2X22] OR (BMED2401 and BMED2404) OR [12cp from (MICR2024 or MICR2X31 or GEGE2X01 or GENE2002)] **Prohibitions:** MICR3932 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1-hour exam (mid semester); one 2-hour exam (end of semester); Prac (40%): One 2-hour exam (open book, mid-semester), one oral presentation (end of semester); one in-prac bioinformatics assessment task, one 1.5 hr bioinformatics prac exam (end of semester) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This Unit of Study introduces students to key concepts in cellular and molecular microbiology. Building on knowledge gained in MICR2021 and MICR2022, as well as MBLG1001, the lectures explore areas of microbial evolution, pathogenesis, physiology, ecology, biotechnology and genetics, with each key theme explored with a series of 6 lectures led by an expert in the field. Lectures will be complemented with practical/tutorial sessions that explore recent research in these areas.

The first set of practical/tutorial sessions are small-group sessions led by demonstrators, that are focused on critical interpretation of the scientific literature in the area of host-microbe interactions. The focus is on experimental design, and analysis of the raw data. The second set of pracs are bioinformatics labs, which introduce software such as ORF Finder, BLAST, ClustalX, and TreeView and databases such as NCBI-Nucleotide and KEGG; the aim is to figure out the identity, functions, and biotechnological applications of a mystery piece of microbial DNA. It is recommended that students also take the complementary unit of study MICR3042 or MICR3942.

MICR3932
Cellular and Molecular Microbiology (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Nick Coleman **Session:** Semester 2 **Classes:** Three lectures per week and one 2-hour prac/tute per week **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in MICR2X22] OR [BMED2401 and BMED2404 and a mark of 75 or above in 6cp from (BMED2401 or BMED2404)] OR [6cp from (MICR2024 or MICR2X31) and a mark of 75 or above in 6cp from (GEGE2X01 or GENE2002)] **Prohibitions:** MICR3032 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** Theory (60%): One 1-hour theory exam (mid semester); one 2-hour exam (end of semester); Prac (40%): one written assessment task, assessment of website. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study introduces students to key concepts in cellular and molecular microbiology. Building on knowledge gained in MICR2021 and MICR2022, as well as MBLG1001, the lectures explore areas of microbial evolution, pathogenesis, physiology, ecology, biotechnology and genetics, with each key theme explored with a series of 6 lectures led by an expert in the field.The first set of practical/tutorial sessions are small-group sessions led by an academic, which are focused on critical interpretation of the scientific literature in the area of host-microbe interactions. The focus is on evaluating the scientific significance of published papers, and determining the level of experimental support for key conclusions. The second set of prac sessions teaches the creative presentation of science to both fellow scientists and the public by designing a website around an area of interest in microbiology. It is recommended that students also take the complementary unit of study, MICR3042 or MICR3942.

Textbooks
None

MICR3042
Microbiology Research Skills

Credit points: 6 **Teacher/Coordinator:** Prof Dee Carter **Session:** Semester 2 **Classes:** Two lectures per week from week 1-7, one 4-hour practical per week. **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and MICR2X22] OR (BMED2401 and BMED2404) OR [12cp from (MICR2024 or MICR2X31 or GEGE2X01 or GENE2002)] **Prohibitions:** MICR3942 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** One 1-hour theory exam (40%). Two 40-min theory of prac exams, in-lab continuous assessment, two prac reports, one short video presentation (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Research in molecular microbiology is needed to tackle problems in medicine, agriculture, environmental science, and biotechnology. This Unit of Study focuses on developing practical skills and training in experimental approaches and that are essential for laboratory research in molecular microbiology, together with knowledge of the underlying theoretical concepts. We will focus on key areas of modern microbiology including Bioremediation, where micro-organisms are used to break down harmful substrates in the environment; Microbial biotechnology, which explores how microbes can be used as cellular factories to produce useful products; Medical microbiology, where molecular epidemiology is used to track a disease outbreak, and Yeast genetics, where we explore genes and protein interaction networks that cells regulate in their response to antibiotic agents. It is strongly recommended that students also take the complementary unit of study MICR3032 or MICR3932.

MICR3942
Microbiology Research Skills (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Dee Carter **Session:** Semester 2 **Classes:** Two lectures per week from Week 1Â¿7. Project work equivalent to 4 hours per week. **Prerequisites:** 6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in MICR2X22] OR [BMED2401 and BMED2404 and a mark of 75 or above in 6cp from (BMED2401 or BMED2404)] OR [6cp from (MICR2024 or MICR2X31) and a mark of 75 or above in 6cp from (GEGE2X01 or GENE2002)] **Prohibitions:** MICR3022 or MICR3922 or MICR3042 **Assumed knowledge:** MICR2X21 or MICR2024 or MICR2X31 **Assessment:** One 1-hour theory exam (40%). Two reports, presentation of research via short video, supervisor mark based on performance in research project (60%) **Practical field work:** Research project in an academic microbiology lab, 48 hours total, at times decided between student and supervisor. Research projects will be announced at the start of semester. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Research in molecular microbiology is needed to tackle problems in medicine, agriculture, environmental science, and biotechnology. This Unit of Study focuses on developing practical skills and training in experimental approaches that are essential for laboratory research in molecular microbiology, together with knowledge of the underlying theoretical concepts. In this Unit the practical component is entirely replaced by a research project undertaken in an academic microbiology lab. The lecture material in MICR3942 focuses on the areas of microbial biotechnology and bioremediation, and the genetic and molecular diversity of medically important eukaryotic microbes. It is strongly recommended that students also take the complementary unit of study, MICR3032 or MICR3932.

VIRO3001
Virology

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 26 1-hour lectures, seven 4-hour practical classes, one 2-hour tutorial **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3901 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam (60%) (120 minutes). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novel vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluorescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Tutorials cover a range of topical issues and provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3901
Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Tim Newsome **Session:** Semester 1 **Classes:** 29 1-hour lectures, seven 4-hour practical classes, four 1-hour tutorials **Prerequisites:** [6cp from (BIOL1XX7 or MBLGXXXX) and a mark of 75 or above in 6cp from (BCHM2XXX or BCMB2X01 or BIOL2XXX or GEGE2X01 or GENE2002 or IMMU2101 or MICR2XXX or PCOL2X0X or PHSI2X0X)] OR [BMED2401 and a mark of 75 or above in BMED2404] **Prohibitions:** VIRO3001 **Assumed knowledge:** Fundamental concepts of microorganisms, biomolecules and ecosystems **Assessment:** Pre-class assessment for practical classes: (5 x 1%), continuous assessment for practical classes: (3 x 2%), project assessment for practical classes: (7%), individual presentation on virology-themed research literature: (7%), theory of practical exam: (15%) (30 minutes), theory exam: (60%) (120 minutes) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly advised to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002 or VIRO3902.BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit is available to students who have performed well in Intermediate Microbiology and is based on VIRO3001 with additional lectures related to the research interests in the Discipline. Consequently, the unit of study content may change from year to year. Viruses are some of the simplest biological machinery known yet they are also the etiological agents for some of the most important human diseases. New technologies that have revolutionised the discovery of viruses are also revealing a hitherto unappreciated abundance and diversity in the ecosphere, and a wider role in human health and disease. Developing new gene technologies have enabled the use of viruses as therapeutic agents, in novle vaccine approaches, gene delivery and in the treatment of cancer. This unit of study is designed to introduce students who have a basic understanding of molecular biology to the rapidly evolving field of virology. Viral infection in plant and animal cells and bacteria is covered by an examination of virus structure, genomes, gene expression and replication. Building upon these foundations, this unit progresses to examine host-virus interactions, pathogenesis, cell injury, the immune response and the prevention and control of infection and outbreaks. The structure and replication of sub-viral agents: viroids and prions, and their role in disease are also covered. The practical component provides hands-on experience in current diagnostic and research techniques such as molecular biology, cell culture, serological techniques, immunofluroescence and immunoblot analyses and is designed to enhance the students' practical skills and complement the lecture series. In these practical sessions experience will be gained handling live, potentially pathogenic microbes. Advanced lectures cover cutting-edge research in the field of virology in small group discussions and presentations that provide a forum for students to develop their communication and critical thinking skills. The unit will be taught by the Discipline of Microbiology within the School of Life and Environmental Sciences with the involvement of the Discipline of Infectious Diseases and Immunology within the Sydney Medical School.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3002
Medical and Applied Virology

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1-hour lectures per week **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR [BMED2401 and BMED2404] **Prohibitions:** VIRO3902 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment and oral presentation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. Practical session slots are also used for oral presentations. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3002.

This unit of study explores diseases in human caused by viruses, with focus on the way viruses infect individual patients and spread in the community, and how virus infections are diagnosed, treated and/or prevented. Host/Virus interactions will also be described with a focus on the viral mechanisms that have evolved to combat and/or evade host defence systems. These features will be used to explain the symptoms, spread and control of the most medically important viruses that cause serious disease in humans . The unit will be taught by the Discipline of Infectious Diseases and Immunology within the Sydney Medical School with the involvement of associated clinical and research experts who will contribute lectures on their own special interests and with contributions from the Discipline of Microbiology. In the practical classes students will have the opportunity to develop their skills in performing methods currently used in diagnostic and research laboratories such as molecular analysis of viral genomes, immunofluorescent staining of viral antigens, cell culture and the culture of viruses.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

VIRO3902
Medical and Applied Virology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Barry Slobedman **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, and one interactive 2-hour tutorials (approx 6 in total, including for oral presentations) **Prerequisites:** [6cp from (BIOL1XX7, MBLGXXXX) and a mark of 75 in 6cp from (BCHM2XXX, BCMB2X01, BIOL2XXX, GEGE2X01, GENE2002, IMMU2101, MICR2XXX, PCOL2X0X, PHSI2X0X)] OR (BMED2401 and a mark of 75 in BMED2404) **Prohibitions:** VIRO3002 **Assumed knowledge:** Fundamental concepts of microorganisms and biomolecules **Assessment:** One 2-hour exam covering lecture material, one 2-hour theory of practical exam, written assignment, oral presentation and tutorial participation (100%) **Practical field work:** One 4 hour practical session per week, in most weeks of semester. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Students are strongly encouraged to complete VIRO3001 or VIRO3901 before enrolling in VIRO3902.

This unit is based on the VIRO3002 course with inclusion of tutorials, including with leading research medical virologists, enabling students to gain additional experience with cutting edge virology research. The content of this unit may change from year to year based on research interests within the department.

Textbooks

Knipe and Howley. Fields Virology. 6th edition 2013. Available freely as an electronic resource from the University of Sydney library.

Table 1: Molecular Biology and Genetics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Molecular Biology and Genetics			
For a major in Molecular Biology and Genetics, the minimum requirement is 24 credit points from senior units of study listed below.			
Junior units of study			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Intermediate units of study			
6 credit points of Intermediate Biochemistry units (taken from BCHM2071/2971 and/or BCHM2072/2972) are a pre-requisite for BCHM3071/3971 and BCHM3072/3972, which are required for a major in Molecular Biology and Genetics.			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
BCMB2002 **Proteins in Cells**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2902	Semester 2
BCMB2902 **Proteins in Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2071 or BCHM2971 or BCMB2002	Semester 2
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
Senior units of study			
BCHM3071 **Molecular Biology and Biochemistry-Genes**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3971 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3971 **Molecular Biology and Biochem-Genes (Adv)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3071 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3072 **Human Molecular Cell Biology**	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3972 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3972 **Human Molecular Cell Biology (Advanced)**	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3072 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BIOL3018 **Gene Technology and Genomics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **N** BIOL3918	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
BIOL3918 **Gene Technology and Genomics (Adv)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **N** BIOL3018	Semester 1
BIOL3026 **Developmental Genetics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **N** BIOL3926	Semester 2
BIOL3926 **Developmental Genetics (Advanced)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **N** BIOL3929 or BIOL3026	Semester 2

Molecular Biology and Genetics

For a major in Molecular Biology and Genetics, the minimum requirement is 24 credit points from senior units of study listed below.

Junior units of study

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks
Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks
Please see unit outline on LMS

Intermediate units of study

6 credit points of Intermediate Biochemistry units (taken from BCHM2071/2971 and/or BCHM2072/2972) are a pre-requisite for BCHM3071/3971 and BCHM3072/3972, which are required for a major in Molecular Biology and Genetics.

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks
Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901
Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2002
Proteins in Cells

Credit points: 6 **Teacher/Coordinator:** Dr Sandro Ataide **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; one 4-hour practical/tutorial session per week **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2071 or BCHM2971 or BCMB2902 **Assessment:** Assignments, skills-based assessment, quiz, final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

A single human cell contains billions of protein molecules that are constantly in motion. Why so many? What are they doing? And, how are they doing it? In simple terms, proteins define the function of and drive almost every process within cells. In this unit of study you will learn about the biochemistry of proteins in their natural environment - within cells - with a focus on eukaryotes including plant and other cell types. You will discover the dynamic interplay within and between proteins and other cellular components and how the physical properties of proteins dictate function. You will discover how proteins are compartmentalized, modified, folded, transported in and between cells, the mechanisms by which proteins regulate biological activities, interact and transport molecules across membranes, and how mutations in proteins can lead to pathological consequences. Our practicals, other guided and online learning sessions will introduce you to a wide range of currently utilised techniques for protein biochemistry ranging from protein visualization, quantification, purification and enzymatic activity, to in silico studies and cellular targeting experiments. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the cellular and molecular biosciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2902
Proteins in Cells (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Sandro Ataide **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; one 4-hour practical/tutorial session per week **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2071 or BCHM2971 or BCMB2002 **Assessment:** Assignment, skills-based assessment, quiz, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

A single human cell contains billions of protein molecules that are constantly in motion. Why so many? What are they doing? And, how are they doing it? In simple terms, proteins define the function of and drive almost every process within cells. In this unit of study you will learn about the biochemistry of proteins in their natural environment - within cells - with a focus on eukaryotes including plant and other cell types. You will discover the dynamic interplay within and between proteins and other cellular components and how the physical properties of proteins dictate function. You will discover how proteins are compartmentalized, modified, folded, transported in and between cells, the mechanisms by which proteins regulate biological activities, interact and transport molecules across membranes, and how mutations in proteins can lead to pathological consequences. There will be a research-focused approach to the advanced practical component, including real and virtual extensions to key experiments. This approach will continue in the lecture series with several unique advanced lectures covering current research topics. You will further investigate a selected area of interest from these topics using original source material and present your findings through an oral presentation in dedicated advanced tutorials.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

GEGE2001
Genetics and Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prohibitions:** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution.

GEGE2901
Genetics and Genomics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution. The Advanced mode of Genetics and Genomics will provide you with challenge and a higher level of academic rigour. You will have the opportunity to plan and carry out a project that will develop your skills in contemporary genetics/molecular biology techniques and will provide you with a greater depth of disciplinary understanding. The Advanced mode will culminate in a written report and in an oral presentation where you will discuss a recent breakthrough that has been enabled by the use of modern genetics and genomics technologies. This is a unit for anyone wanting to better understand the how genetics has shaped the earth and how it will shape the future.

Textbooks

TBA

Senior units of study

BCHM3071
Molecular Biology and Biochemistry-Genes

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3971 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester practical work and assignments (30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3971
Molecular Biology and Biochem-Genes (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3071 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

The lecture component of this unit of study is the same as BCHM3071. Qualified students will attend seminars/practical classes in which more sophisticated topics in gene expression and manipulation will be covered.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3072
Human Molecular Cell Biology

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3972 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BCHM3972
Human Molecular Cell Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3072 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

The lecture component of this unit of study is the same as BCHM3072. Qualified students will attend seminars/practical classes in which more sophisticated topics in modern molecular cell biology will be covered.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BIOL3018

Gene Technology and Genomics

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX) **Prohibitions:** BIOL3918 **Assessment:** One 2-hour exam (60%), assignments (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

A unit of study with lectures, practicals and tutorials on the application of recombinant DNA technology and the genetic manipulation of prokaryotic and eukaryotic organisms. Lectures cover the applications of molecular genetics in biotechnology and consider the regulation, impact and implications of genetic engineering and genomics. Topics include biological sequence data and databases, comparative genomics, the cloning and expression of foreign genes in bacteria, yeast, animal and plant cells, novel human and animal therapeutics and vaccines, new diagnostic techniques for human and veterinary disease, and the genetic engineering of animals and plants. Practical work may include nucleic acid isolation and manipulation, gene cloning and PCR amplification, DNA sequencing and bioinformatics, immunological detection of proteins, and the genetic transformation and assay of plants.

BIOL3918

Gene Technology and Genomics (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Mary Byrne **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BCMB2XXX or QBIO2001 or IMMU2XXX or BIOL2XXX)] **Prohibitions:** BIOL3018 **Assessment:** One 2-hour exam (60%), assignments (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components of BIOL3018 Gene Technology and Genomics. The content and nature of these components may vary from year to year.

BIOL3026

Developmental Genetics

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **Prohibitions:** BIOL3926 **Assessment:** One 2-hour exam, assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Developmental genetics discusses major concepts and our current understanding of developmental biology with an emphasis on molecular genetics. The developmental genetics of animal and plant systems will be investigated, along with approaches used to determine gene function in relation to development of complex multicellular organisms. Topics include the features and resources for model organisms; the generation of mutants for forward and reverse genetics; the application of mutants to the study gene function and gene networks; spatial and temporal gene expression in pattern formation; quantitative trait loci analysis; utility of genome wide association studies; epigenetics in relation to inheritance; genome information in the study of human genetics. Reference will be made to the use of modern techniques in developmental biology such as transgenics, recombinant DNA technology, tissue-specific expression analysis. Various methods of genetic mapping will be covered. Practical work complements the theoretical aspects of the course and develops important skills in genetics.

BIOL3926

Developmental Genetics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **Prohibitions:** BIOL3929 or BIOL3026 **Assessment:** One 2-hour exam, assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components to BIOL3026 Developmental Genetics. The content and nature of these components may vary from year to year. Some assessment will be in an alternative format to components of BIOL3026.

Table 1: Nanoscience and Technology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Nanoscience and Technology			
A major in Nanoscience and Technology requires 24 credit points of study at senior level taken from the following: - Materials Chemistry (CHEM3112/3912) - Membranes, Self-Assembly & Surfaces (CHEM3116/3916) - Quantum Physics/Computational Physics & Lab (PHYS3039/3939) - Statistical Mechanics/Condensed Matter Physics & Lab (PHYS3099/3999) - Mechanics of Solids 2 (MECH3361) - Materials 2 (MECH3362)			
CHEM3112 **Materials Chemistry**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3912	Semester 1
CHEM3912 **Materials Chemistry (Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3112	Semester 1
CHEM3116 **Membranes, Self Assembly and Surfaces**	6	**P** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **N** CHEM3916	Semester 2
CHEM3916 **Membranes, Self Assembly and Surfaces(Adv)**	6	**P** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **N** CHEM3116	Semester 2
PHYS3039 **Quantum Physics/Comp. Physics and Lab**	6	**P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) **N** PHYS3939 or PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944 or PHYS3060 or PHYS3960 or PHYS3961 or PHYS3062 or PHYS3962 or COSC3011 or COSC3911	Semester 1
PHYS3939 **Quantum Physics/Comp. Phys. and Lab (Adv)**	6	**P** A mark of 70 or above in both PHYS2X11 and PHYS2X12 **N** PHYS3039 or PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944 or PHYS3060 or PHYS3960 or PHYS3961 or PHYS3062 or PHYS3962 or COSC3011 or COSC3911	Semester 1
PHYS3099 **Stat. Mechanics/Cond. Matter and Lab**	6	**P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS3039 or PHYS3939) **N** Any one of the following (PHYS3090, PHYS3990, PHYS3999, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3074, PHYS3974, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981)	Semester 2
PHYS3999 **Stat. Mechanics/Cond. Matter and Lab (Adv)**	6	**P** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and PHYS3X39 **N** PHYS3090 or PHYS3990 or PHYS3099 or PHYS3062 or PHYS3962 or PHYS3068 or PHYS3968 or PHYS3074 or PHYS3974 or PHYS3079 or PHYS3979 or PHYS3080 or PHYS3980 or PHYS3081 or PHYS3981	Semester 2
MECH3361 **Mechanics of Solids 2**	6	**P** AMME2301 AND (AMME1362 OR AMME2302 OR CIVL2110)	Semester 2
MECH3362 **Materials 2**	6	**A** (1) A good understanding of basic knowledge and principles of material science and engineering from Materials I and mechanics of solids for simple structural elements (in tension, bending, torsion); (2) Reasonable mathematical skills in calculation of stresses and strains in simple structural elements. **P** AMME2301 AND (AMME2302 OR AMME1362 OR CIVL2110)	Semester 1

Nanoscience and Technology

A major in Nanoscience and Technology requires 24 credit points of study at senior level taken from the following:- Materials Chemistry (CHEM3112/3912)- Membranes, Self-Assembly & Surfaces (CHEM3116/3916)- Quantum Physics/Computational Physics & Lab (PHYS3039/3939)- Statistical Mechanics/Condensed Matter Physics & Lab (PHYS3099/3999)- Mechanics of Solids 2 (MECH3361)- Materials 2 (MECH3362)

CHEM3112
Materials Chemistry

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures per week and two 4-hour practicals per week for half of semester. **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3912 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course concerns the inorganic chemistry of solid-state materials: compounds that possess 'infinite' bonding networks. The extended structure of solid materials gives rise to a wide range of important chemical, mechanical, electrical, magnetic and optical properties. Consequently such materials are of enormous technological significance as well as fundamental curiosity. In this course you will learn how chemistry can be used to design and synthesise novel materials with desirable properties. The course will start with familiar molecules such as C60 and examine their solid states to understand how the nature of chemical bonding changes in the solid state, leading to new properties such as electronic conduction. This will be the basis for a broader examination of how chemistry is related to structure, and how structure is related to properties such as catalytic activity, mechanical strength, magnetism, and superconductivity. The symmetry of solids will be used explain how their structures are classified, how they can transform between related structures when external conditions such as temperature, pressure and electric field are changed, and how this can be exploited in technological applications such as sensors and switches. Key techniques used to characterise solid-state materials will be covered, particularly X-ray diffraction, microscopy, and physical property measurements.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3912
Materials Chemistry (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3112 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course concerns the inorganic chemistry of solid-state materials: compounds that possess 'infinite' bonding networks. The extended structure of solid materials gives rise to a wide range of important chemical, mechanical, electrical, magnetic and optical properties. Consequently, such materials are of enormous technological significance as well as fundamental curiosity. In this course you will learn how chemistry can be used to design and synthesize novel materials with desirable properties. The course will start with familiar molecules such as C60 and examine their solid states to understand how the nature of chemical bonding changes in the solid state, leading to new properties such as electronic conduction. This will be the basis for a broader examination of how chemistry is related to structure, and how structure is related to properties such as catalytic activity, mechanical strength, magnetism, and superconductivity. The symmetry of solids will be used explain how their structures are classified, how they can transform between related structures when external conditions such as temperature, pressure and electric field are changed, and how this can be exploited in technological applications such as sensors and switches. Key techniques used to characterise solid-state materials will be covered, particularly X-ray diffraction, microscopy, and physical property measurements. CHEM3912 students attend the same lectures as CHEM3112 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3116
Membranes, Self Assembly and Surfaces

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week and two 4-hour practicals per week for half of semester. **Prerequisites:** (CHEM2401 or CHEM2911 or CHEM2915) and (CHEM2402 or CHEM2912 or CHEM2916) **Prohibitions:** CHEM3916 **Assessment:** Assignment, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Away from the covalent and ionic interactions that hold molecules and solids together is the world of fragile objects - folded polymers, membranes, surface adsorption and stable molecular aggregates - held together by weak forces such as van der Waals and the hydrophobic effect. The use of molecules rather than atoms as building blocks means that there are an enormous number of possibilities for stable aggregates with interesting chemical, physical and biological properties, many of which still wait to be explored. In this course we will examine the molecular interactions that drive self assembly and the consequences of these interactions in supramolecular assembly, lipid membrane formations and properties, microemulsions, polymer conformation and dynamics and range of fundamental surface properties including adhesion, wetting and colloidal stability.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

CHEM3916
Membranes, Self Assembly and Surfaces(Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures per week, one 1-hour seminar per week, and two 4-hour practicals per week for half of semester. **Prerequisites:** WAM of 65 or greater and (Credit or better in (CHEM2401 or CHEM2911 or CHEM2915)) and (Credit or better in (CHEM2402 or CHEM2912 or CHEM2916)) **Prohibitions:** CHEM3116 **Assessment:** Assignments, prac reports and oral, final examination (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Away from the covalent and ionic interactions that hold molecules and solids together is the world of fragile objects - folded polymers, membranes, surface adsorption and stable molecular aggregates - held together by weak forces such as van der Waals and the hydrophobic effect. The use of molecules rather than atoms as building blocks means that there are an enormous number of possibilities for stable aggregates with interesting chemical, physical and biological properties, many of which still wait to be explored. In this course we examine the molecular interactions that drive self assembly and the consequences of these interactions in supramolecular assembly, lipid membrane formations and properties, microemulsions, polymer conformation and dynamics and range of fundamental surface properties including adhesion, wetting and colloidal stability. CHEM3916 students attend the same lectures as CHEM3916 students, but attend an additional advanced seminar series comprising one lecture a week for 12 weeks.

Textbooks

See http://sydney.edu.au/science/chemistry/studying-chemistry/undergraduate/senior-chemistry.shtml

PHYS3039
Quantum Physics/Comp. Physics and Lab

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Twenty seven 1-hour lectures, eight 2-hour computer labs and six 4-hour experimental labs. **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) **Prohibitions:** PHYS3939 or PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944 or PHYS3060 or PHYS3960 or PHYS3961 or PHYS3062 or PHYS3962 or COSC3011 or COSC3911 **Assessment:** One 2-hour exam, assignments and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Quantum Physics build on Intermediate Quantum Physics to cover more advanced topics, including atomic theory and spectroscopy, quantisation of the hydrogen atom, angular momentum in quantum mechanics, and perturbation theory.

The module on Computational Physics uses a mixture of lectures and computational lab sessions to explore problem solving using computers. It covers numerical schemes for solving ordinary and partial differential equations, with emphasis on choosing the best method to suit the problem, and on understanding numerical accuracy and stability. All coding is done in MATLAB, and no programming experience is assumed beyond that covered in Intermediate Physics.

In the Laboratory Classes, students will choose from a range of experiments that aim to give them an appreciation of the analytical, technical and practical skills required to conduct modern experimental work.

PHYS3939
Quantum Physics/Comp. Phys. and Lab (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Twenty seven 1-hour lectures, eight 2-hour computer labs and six 4-hour experimental labs. **Prerequisites:** A mark of 70 or above in both PHYS2X11 and PHYS2X12 **Prohibitions:** PHYS3039 or PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944 or PHYS3060 or PHYS3960 or PHYS3961 or PHYS3062 or PHYS3962 or COSC3011 or COSC3911 **Assessment:** One 2-hour exam, quizzes, assignments and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3039, but with greater depth and some more challenging material.

PHYS3099
Stat. Mechanics/Cond. Matter and Lab

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Thirty eight 1-hour lectures and six 4-hour experimental labs. **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS3039 or PHYS3939) **Prohibitions:** Any one of the following (PHYS3090, PHYS3990, PHYS3999, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3074, PHYS3974, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981) **Assessment:** One 1.5-hour exam, one 1-hour exam, assignments and laboratory reports (100%). **Campus:**

Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Statistical Mechanics aim to provide a theoretical foundation for statistical mechanics, including both classical and quantum distributions.

The lectures on Condensed Matter Physics provide a basic introduction to condensed matter systems, specifically the physics that underlies the electromagnetic, thermal, and optical properties of solids. The course draws on basic quantum theory and statistical mechanics and considers recent discoveries and new developments in semiconductors, nanostructures, magnetism, and superconductivity.

In the Laboratory Classes, students will choose from a range of experiments that aim to give them an appreciation of the analytical, technical and practical skills required to conduct modern experimental work.

Textbooks

An Introduction to Thermal Physics, David V. Schroeder.

PHYS3999
Stat. Mechanics/Cond. Matter and Lab (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Thirty eight 1-hour lectures and six 4-hour experimental labs. **Prerequisites:** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and PHYS3X39 **Prohibitions:** PHYS3090 or PHYS3990 or PHYS3099 or PHYS3062 or PHYS3962 or PHYS3068 or PHYS3968 or PHYS3074 or PHYS3974 or PHYS3079 or PHYS3979 or PHYS3080 or PHYS3980 or PHYS3081 or PHYS3981 **Assessment:** One 1.5-hour exam, one 1-hour exam, assignments and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3099, but with greater depth and some more challenging material.

Textbooks

An Introduction to Thermal Physics, David V. Schroeder

MECH3361
Mechanics of Solids 2

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, Tutorials, Laboratories **Prerequisites:** AMME2301 AND (AMME1362 OR AMME2302 OR CIVL2110) **Assessment:** Through semester assessment (50%) and Final Exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit of study aims to: teach the fundamentals of analysing stress and deformation in a solid under complex loading associated with the elemental structures/components in aerospace, mechanical and biomedical engineering; develop the following attributes: understand the fundamental principles of solid mechanics and basic methods for stress and deformation analysis of a solid structure/element in the above mentioned engineering areas; gain the ability to analyse problems in terms of strength and deformation in relation to the design, manufacturing and maintenance of machines, structures, devices and elements in the above mentioned engineering areas.

At the end of this unit students will have a good understanding of the following: applicability of the theories and why so; how and why to do stress analysis; why we need equations of motion/equilibrium; how and why to do strain analysis; why we need compatibility equations; why Hooke's law, why plasticity and how to do elastic and plastic analysis; how and why to do mechanics modelling; how to describe boundary conditions for complex engineering problems; why and how to solve a mechanics model based on a practical problem; why and how to use energy methods for stress and deformation analysis; why and how to do stress concentration analysis and its relation to fracture and service life of a component/structure; how and why to do fundamental plastic deformation analysis; how and why the finite element method is introduced and used for stress and deformation analysis.

The students are expected to develop the ability of solving engineering problems by comprehensively using the skills attained above. The students will get familiar with finite element analysis as a research and analysis tool for various real-life problems.

MECH3362
Materials 2

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures, Tutorials, Laboratories **Prerequisites:** AMME2301 AND (AMME2302 OR AMME1362 OR CIVL2110) **Assumed knowledge:** (1) A good understanding of basic knowledge and principles of material science and engineering from Materials I and mechanics of solids for simple structural elements (in tension, bending, torsion); (2) Reasonable mathematical skills in calculation of stresses and strains in simple structural elements. **Assessment:** Through semester assessment (45%) and Final Exam (55%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims for students to understand the relationship between properties of materials and their microstructures and to improve mechanical design based on knowledge of mechanics and properties of materials.

At the end of this unit students should have the capability to select proper materials for simple engineering design.

Course content will include: short-term and long-term mechanical properties; introductory fracture and fatigue mechanics, dislocations; polymers and polymer composite materials; ceramics and glasses; structure-property relationships; selection of materials in mechanical design.

Table 1: Neuroscience

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Neuroscience			
For a major in Neuroscience, students are required to complete at least 24 credit points of senior units of study from PCOL3022/3922, NEUR3005/3905, NEUR3006/3906, NEUR3003/3903, NEUR3004/3904, PSYC3011, PSYC3012, PSYC3013, PSYC3014/3914. At least two subject areas must be chosen from the three subject areas NEUR, PSYC and PCOL.			
Intermediate units of study			
ANAT2010 **Concepts of Neuroanatomy**	6	**A** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **N** ANAT2910 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 2
ANAT2910 **Concepts in Neuroanatomy Adv**	6	**A** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **P** Annual average mark of at least 70 in previous year **N** ANAT2010 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *Note: Department permission required for enrolment*	Semester 2
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
PCOL2011 **Pharmacology Fundamentals**	6	**A** BIOL1XXX or MBLG1XX1 **P** 6cp from CHEM1XXX **N** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
PCOL2012 **Pharmacology: Drugs and People**	6	**A** (BIOL1XXX or MBLG1XX1) and PCOL2011 **P** 6cp from CHEM1XXX **N** PCOL2555	Semester 2
PHSI2005 **Integrated Physiology A**	6	**P** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PHSI2905 **Integrated Physiology A (Advanced)**	6	**P** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PHSI2006 **Integrated Physiology B**	6	**P** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2906 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units is highly recommended for progression to Senior Physiology. It is recommended that PHSI2005 is completed before enrolling in PHSI2006.*	Semester 2
PHSI2906 **Integrated Physiology B (Advanced)**	6	**P** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2006 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 2
PSYC2010 **Brain and Behaviour**	6	**P** PSYC1002 **N** PSYC2011, PSYC2911, PSYC2910	Semester 1
PSYC2910 **Brain and Behaviour (Advanced)**	6	**P** A mark of at least 75 in PSYC1002 **N** PSYC2011, PSYC2911, PSYC2010	Semester 1
PSYC2013 **Cognitive and Social Psychology**	6	**P** PSYC1001 and PSYC1002	Semester 2
Senior units of study			
For a major in Neuroscience, 24 credit points must be chosen from any of the following units: PCOL3022/3922, NEUR3005/3905, NEUR3006/3906, NEUR3003/3903, NEUR3004/3904, PSYC3011/3911, PSYC3012, PSYC3013/3913, PSYC3014/3914. *Legacy units: NEUR3001/3901, NEUR3002/3902. At least two subject areas must be chosen from the three subject areas NEUR, PSYC and PCOL.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
NEUR3003 **Cellular and Developmental Neuroscience**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **N** NEUR3903 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3903 **Cellular and Developmental Neurosci. (Adv)**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **P** Annual average mark of 70 or above in the previous year **N** NEUR3003 *Note: Department permission required for enrolment* *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3004 **Integrative Neuroscience**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **N** NEUR3904 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3904 **Integrative Neuroscience (Advanced)**	6	**A** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **P** Annual average mark of 70 or above in the previous year **N** NEUR3004 *Note: Department permission required for enrolment* *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
NEUR3005 **Functional Neuroanatomy**	6	**A** [ANAT2010 or ANAT2910 or (BMED2401 and 12 additional credit points of BMED2402, BMED2403, BMED2405, BMED2406) **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3905 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3905 **Functional Neuroanatomy (Advanced)**	6	**A** [ANAT2010 or ANAT2910) or (BMED2401 and 12 additional credit points of BMED240X) **P** Annual average mark of 70 or above in the previous year **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3005 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3006 **Neural Information Processing**	6	**P** PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X) **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NEUR3906 **Neural Information Processing (Advanced)**	6	**P** A mark of 75 or above in [PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X)] **N** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3006 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PCOL3022 **Neuropharmacology**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **N** PCOL3922	Semester 2
PCOL3922 **Neuropharmacology (Advanced)**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **P** An annual average mark of 70 or above in the previous year **N** PCOL3022	Semester 2
PSYC3011 **Learning and Behaviour**	6	**P** (PSYC2011 or PSYC2911 or PSYC2010 or PSYC2910) and PSYC2012 **N** PSYC3911	Semester 1
PSYC3911 **Learning and Behaviour (Advanced)**	6	**P** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **N** PSYC3011	Semester 1
PSYC3012 **Cognition, Language and Thought**	6	**P** PSYC2012 and PSYC2013	Semester 1
PSYC3013 **Perceptual Systems**	6	**P** (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and PSYC2012 **N** PSYC3913	Semester 2
PSYC3913 **Perceptual Systems (Advanced)**	6	**P** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **N** PSYC3013	Semester 2
PSYC3014 **Behavioural and Cognitive Neuroscience**	6	**P** [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **N** PSYC3914	Semester 2
PSYC3914 **Behavioural and Cognitive Neuroscience Adv**	6	**P** [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **N** PSYC3014	Semester 2

Neuroscience

For a major in Neuroscience, students are required to complete at least 24 credit points of senior units of study from PCOL3022/3922, NEUR3005/3905, NEUR3006/3906, NEUR3003/3903, NEUR3004/3904, PSYC3011, PSYC3012, PSYC3013, PSYC3014/3914.At least two subject areas must be chosen from the three subject areas NEUR, PSYC and PCOL.

Intermediate units of study

ANAT2010
Concepts of Neuroanatomy

Credit points: 6 **Teacher/Coordinator:** Dr Karen Cullen **Session:** Semester 2 **Classes:** two 1-hour lectures per week **Prohibitions:** ANAT2910 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **Assessment:** One theory exam, one practical exam, one mid-semester in-class quiz, periodic online quizzes and written poster presentation **Practical field work:** Tutorials: One 2-hour practical tutorial in 5 sessions during semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students are introduced to the structure and organisation of the central and peripheral nervous system. The course begins with an exploration into the make-up of the individual cells, followed by an examination of the different regions of the nervous system. A final theme of the course touches on the organisation of sensory, motor and integrative systems, together with aspects of higher-order function such as memory and language. The subject covers general concepts of organisation, structure and function of the brain. Tutorial meetings will provide the opportunity to encounter topics in functional anatomy and histology of the brain using photographs, diagrams, models, animations and problem-solving. Topics in identification of central nervous system structure in typical magnetic resonance images will assist in reinforcing the theory of functional anatomy in a format students are likely to encounter in further study and in real-world situations and readings. This course will be of considerable interest to students studying anatomy and related disciplines, as well as those wishing to pursue further study in Neuroscience at senior levels.

Textbooks

Bear, MF, Connors, BW, Paradiso, MA. Neuroscience: Exploring the Brain. 3rd edition. Williams and Wilkins. 2006. Also recommended: Nolte J, Angevine JJB. The Human Brain in Photographs and Diagrams. Mosby/Elsevier. 2007.

ANAT2910
Concepts in Neuroanatomy Adv

Credit points: 6 **Teacher/Coordinator:** Dr Karen Cullen **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 1 x 1hr tutorial **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** ANAT2010 or BIOS1171 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XX3 or BIOL1XX8 or MEDS1X01 **Assessment:** one 2-hour theory exam, one 45 min practical exam, one 1200 word critical scientific review article, one mid-semester quiz, three short online quiz-style assignments **Practical field work:** 1 x 1 hr practical **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Students are introduced to the structure and organisation of the central and peripheral nervous system. The course begins with an exploration into the make-up of the individual cells, followed by an examination of the different regions of the nervous system. A final theme of the course touches on the organisation of various systems (sensory and motor), together with aspects of higher-order function such as memory and language. In essence, the subject covers general concepts of organisation, structure and function of the brain. The laboratory practical sessions offer students the special privilege to examine human specimens in the Anatomy labs and museum. Tutorial meetings will provide the opportunity to encounter topics in functional anatomy and histology of the brain using photographs, diagrams, models, animations and problem-solving. Topics in identification of central nervous system structure in typical magnetic resonance images will assist in reinforcing the theory of functional anatomy in a format students are likely to encounter in further study and in real-world situations and readings. This course will be of considerable interest to students studying anatomy and related disciplines, as well as those wishing to pursue further study in Neuroscience at senior levels.

Textbooks

Required text: Bear, M.F., B.W. Connors, M.A. Paradiso. Neuroscience. Exploring the Brain (4th edition) Wolters Kluwer, 2016. Recommended Atlas: Nolte and Angevine. The human brain in photographs and diagrams. 4th edition Philadelphia: Elsevier/Saunders, 2013.

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901
Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

GEGE2001
Genetics and Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prohibitions:** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution.

GEGE2901
Genetics and Genomics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution. The Advanced mode of Genetics and Genomics will provide you with challenge and a higher level of academic rigour. You will have the opportunity to plan and carry out a project that will develop your skills in contemporary genetics/molecular biology techniques and will provide you with a greater depth of disciplinary understanding. The Advanced mode will culminate in a written report and in an oral presentation where you will discuss a recent breakthrough that has been enabled by the use of modern genetics and genomics technologies. This is a unit for anyone wanting to better understand the how genetics has shaped the earth and how it will shape the future.

Textbooks

TBA

PCOL2011
Pharmacology Fundamentals

Credit points: 6 **Teacher/Coordinator:** Dr Hilary Lloyd **Session:** Semester 1 **Classes:** Lectures (2 x1 hr per week); wet and dry labs (5 x4 hrs), data anaylsis tutorials (2 x 2 hrs); workshops (6 x 2 hrs) **Prerequisites:** 6cp from CHEM1XXX **Prohibitions:** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XXX or MBLG1XX1 **Assessment:** In-semester (40%), which consists of 4 x on-line quizzes, 2 x lab reports, 3 x research topics, 1 x oral presentation, end-of-semester examination (60%), which consists of multiple choice and short answer questions **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides the fundamental grounding in four basic areas in Pharmacology: (1) principles of drug action (2) pharmacokinetics and drug metabolism (3) experimental design and autonomic pharmacology, and (4) drug design. The delivery of material involves lectures, practicals, computer-aided learning and problem-based workshops. Practical classes provide students with the opportunity of acquiring technical experience and teamwork skills. Problem-based workshops are based on real-life scenarios of drug use in the community. These workshops require students to integrate information obtained in lectures in order to provide solutions to the problems. Online quizzes accompany each module and are to encourage continued learning throughout the semester.

Textbooks

Rang and Dale's Pharmacology, 8th Edition. H. P. Rang, J. M. Ritter, R. J. Flower, and G. Henderson, (Elsevier 2016). Medical Pharmacology at a Glance, 7th edn M.J. Neal: (Blackwell Scientific Publications, 2012).

PCOL2012
Pharmacology: Drugs and People

Credit points: 6 **Teacher/Coordinator:** Dr Hilary Lloyd **Session:** Semester 2 **Classes:** Lectures (2x1 hr per week); wet and dry labs (5 x 4 hrs), data analysis tutorials (2 x 2 hrs); workshops (6 x 2 hrs) **Prerequisites:** 6cp from CHEM1XXX **Prohibitions:** PCOL2555 **Assumed knowledge:** (BIOL1XXX or MBLG1XX1) and PCOL2011 **Assessment:** In-semester (40%), which consists of 4 x on-line quizzes, 2 x lab reports, 3 x research topics, 1 x oral presentation, end-of-semester examination (60%), which consists of multiple choice and short answer questions **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines four important areas of Pharmacology: (1) Principles of drug action in the nervous system; (2) Drug abuse, addiction and analgesia; (3) Drug treatment of allergies and GI disorders; (4) Introduction to drug discovery and development. The delivery of material involves lectures, practicals, computer-aided learning and problem-based workshops. Practical classes provide students with the opportunity of acquiring technical experience and teamwork skills. Problem-based workshops are based on real-life scenarios of drug use in the community. These workshops require students to apply information obtained in lectures and readings in order to 'solve' the problems. Workshop activities will include oral presentations.

Textbooks

Rang and Dale's Pharmacology, 8th Edition. H. P. Rang, J. M. Ritter, R. J. Flower, and G. Henderson, (Elsevier 2015). Medical Pharmacology at a Glance, 7th edn M.J. Neal: (Blackwell Scientific Publications, 2012).

PHSI2005
Integrated Physiology A

Credit points: 6 **Teacher/Coordinator:** Dr Michael Morris **Session:** Semester 1 **Classes:** Three 1 hour lectures per week. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual written assessments, and quizzes (100%) **Practical field work:** One 3 hour practical or one 3 hour tutorial per week. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study offers an introduction to the basic concepts underpinning physiology, excitable cell (nerve and muscle) physiology, as well as the functions of the nervous system (central processing, and sensory and motor systems). It also incorporates cardiovascular and exercise physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Tutorial sessions develop critical thinking, the integrative nature of physiology, and generic skills in scientific writing and presentation. The practicals and tutorials also emphasise group learning and team work.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 7th edition. 2015. ISBN-10: 0321981227; ISBN-13: 978-0321981226 (International Edition)

PHSI2905
Integrated Physiology A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 1 **Classes:** Five 1 hour lectures, one 3 hour practical and one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. Students will also be exempt from all Inquiry-based learning tutorials. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or

BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2005 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2005. This unit of study offers a basic introduction to the functions of the nervous system, excitable cell (nerve and muscle) physiology, sensory and motor systems, and central processing. It also incorporates haematology and cardiovascular physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Inquiry-based learning sessions develop critical thinking and generic skills while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2010. ISBN 10:0-321-1750071; ISBN 13:978-0-321-750075 (International Edition).

PHSI2006
Integrated Physiology B

Credit points: 6 **Teacher/Coordinator:** Dr Bronwyn McAllan **Session:** Semester 2 **Classes:** Three 1 hour lectures per week, and one 3 hour practical or one 3 hour tutorial per week. There will be one 4 hour practical session. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2906 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** Two written exams; group and individual written and oral presentations (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units is highly recommended for progression to Senior Physiology. It is recommended that PHSI2005 is completed before enrolling in PHSI2006.

This unit of study offers a basic introduction to the functions of the remaining body systems: gastrointestinal, respiratory, haematology, endocrine, reproductive and renal. The practical component involves experiments on humans and computer simulations, with an emphasis on hypothesis generation and data analysis. The tutorial sessions develop critical thinking and graduate attributes while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2012. ISBN-10: 0321750071. ISBN-13: 978-0321750075.

PHSI2906
Integrated Physiology B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 2 **Classes:** Three 1 hour lectures per week, and one 3 hour practical and/or one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2006 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2006 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2006. This unit of study gives a basic introduction to the remaining of the body systems: gastrointestinal, respiratory, endocrine, reproductive and renal. The practical component involves simple experiments on humans, isolated tissues, and computer simulations, with an emphasis on hypothesis generation and data analysis. Both oral and written communication skills are emphasised, as well as group learning. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2012. ISBN 10:0-321-750071; ISBN 13:978-0-321-750075 (International Edition).

PSYC2010
Brain and Behaviour

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2910 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study examines a range of phenomena and principles in behaviour, learning and perception, abnormal psychology and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes are designed for students with an interest in clinical and therapeutic Psychology, and will allow students to design and implement a behaviour modification programme.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.
Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2910
Brain and Behaviour (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Ian Johnston **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** A mark of at least 75 in PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2010 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study focuses on the Behavioural Sciences, Neurosciences, Abnormal Psychology and the study of perception. The lecture content is the same as PSYC2011, and examines a range of phenomena and principles in behaviour, learning and perception, and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes differ from PSYC2011, as it is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. Students will gain hands-on laboratory experience in how the principles and phenomena of behavioural neuroscience may be studied experimentally.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.
Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2013
Cognitive and Social Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** PSYC1001 and PSYC1002 **Assessment:** One 2 hour exam, major assignment (1500-2000 word essay/report), minor assignment (short written practical exercise and/or tutorial quiz) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit expands the depth and range of topics introduced in the first year lectures on Cognitive Processes, Social Psychology and Developmental Psychology. The section on Cognitive Processes focuses on current theories of memory, attention, and reasoning and discusses the methods and issues involved in investigating these processes in both healthy individuals and people with cognitive dysfunctions. The second section on Social Psychology examines salient social constructs such as impression management, and prejudice, and explores how mental processes affect social judgment and behaviour. The final section on Developmental Psychology presents and evaluates evidence about the early influences on children's social and cognitive development.

Senior units of study

For a major in Neuroscience, 24 credit points must be chosen from any of the following units: PCOL3022/3922, NEUR3005/3905, NEUR3006/3906, NEUR3003/3903, NEUR3004/3904, PSYC3011/3911, PSYC3012, PSYC3013/3913, PSYC3014/3914. *Legacy units: NEUR3001/3901, NEUR3002/3902. At least two subject areas must be chosen from the three subject areas NEUR, PSYC and PCOL.

NEUR3003
Cellular and Developmental Neuroscience

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Three 1-hour lectures plus one 1-hour tutorial per week. **Prohibitions:** NEUR3903 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Final exam. Mid-semester exam, Major essay/report, attendance and particpation in assessment of Advanced student presentations (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This second semester unit is designed to introduce students to "cutting edge" issues in the neurosciences. This course is a combination of small lectures on current issues in cellular and developmental neuroscience and a research-based library project. Issues covered in the lecture series will include the role of glial on cerebral blood flow and neural transmission, neurochemistry and psychiatric disorders and the development of central and peripheral nervous systems.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition. Elsevier. 2000.

NEUR3903
Cellular and Developmental Neurosci. (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Three 1-hour lectures and one 2-hour lab session per week. **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3003 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Final exam. Mid-semester exam, Mini-lecture presentation and resources, Attendance at and participation in assessment of advanced student presentations (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit encompasses the material taught in NEUR3003. Advanced students perform a research project and present a mini-lecture on a current topic in neuroscience.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition. Elsevier. 2000.

NEUR3004
Integrative Neuroscience

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** One 1-hour lecture, one 2-hour tutorial per week. **Prohibitions:** NEUR3904 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Mid-semester exam, Final exam, 3 short in-semester assessments/reports, Tutorial participation, attendance and at participation in assessment of Advanced student presentations (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This second semester unit is designed to introduce students to "cutting edge" issues in the neurosciences and to be taken in conjunction with NEUR3003. This course is a combination of small group lectures on current issues in neuroscience, seminar groups and a research-based library project. Seminars will be held on topics including imaging pain, emotions, cortical development and plasticity, colour vision, stroke and hypertension, and long-term regulation of blood pressure.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition.

NEUR3904
Integrative Neuroscience (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Kevin Keay, Dr Catherine Leamey **Session:** Semester 2 **Classes:** Up to one 1-hour lecture, one 2-hour tutorial and one two hour laboratory session per week on average. **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3004 **Assumed knowledge:** Students who have not successfully completed an introductory neuroscience course are advised to familarise themselves with the content in Bear, Connors and Paradiso "Exploring the Brain". **Assessment:** Mid-semester exam, Final exam, Major essay/report, Tutorial participation, Attendance at and participation in assessment of advanced student presentations (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit encompasses the material taught in NEUR3004. Advanced students perform a research project and present a mini-lecture on a current topic in neuroscience research.

BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Textbooks

Kandell, Schwartz and Jessell. Principles of Neural Science. 4th edition.

NEUR3005
Functional Neuroanatomy

Credit points: 6 **Teacher/Coordinator:** Dr Paul Austin **Session:** Semester 1 **Classes:** Two one-hour lectures per week, one guest leacture, 3 two-hour seminars **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3905 **Assumed knowledge:** [ANAT2010 or ANAT2910 or (BMED2401 and 12 additional credit points of BMED2402, BMED2403, BMED2405, BMED2406) **Assessment:** One mid-semester practical quiz (in-class), one final theory exam, one final practical exam, 'Neuroscience in the Media' 3 team-based assessment tasks during seminars and 1 individual written assignment **Practical field work:** Weekly 1.5 hour practical class **Campus:**

Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of functional neuroanatomy and systems neuroscience, and an appreciation that neuroscience is a constantly evolving field. There will be a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities. The neural circuits and mechanisms that control somatic and autonomic motor systems, motivated behaviours, emotions, and other higher order functions will be explored in great detail based on current neuroscience literature. Practical classes will allow students to identify and learn the functions of critical anatomical structures in human brain and spinal cord specimens. Reading and interpreting images from functional and structural brain imaging techniques will be incorporated into the neuroanatomy practical classes, and develop an appreciation of how these technologies can be used in neuroscience research. The Neuroscience in the Media seminars will develop neuroscience literature searching skills as well as developing critical thinking and analysis of the accuracy of themedia portrayal of neuroscience research. Building on these skills and working in small groups, students will re-frame and communicate neuroscience evidence through the production of a short video. Students will also learn the skills required to write an unbiased and accurate popular media article based on a recent neuroscience research paper. This unit will develop key attributes that are essential for science graduates as they move forward in their careers.

Textbooks

Nolte's. The Human Brain by Todd Vanderah and Douglas Gould. 7th Ed, Elsevier, 2015
The Human Brain in Photographs and Diagrams by John Nolte. 4th Ed, Mosby, 2013

NEUR3905
Functional Neuroanatomy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Paul Austin **Session:** Semester 1 **Classes:** Two one-hour lectures per week, 8 one-hour seminars **Prerequisites:** Annual average mark of 70 or above in the previous year **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3005 **Assumed knowledge:** [ANAT2010 or ANAT2910) or (BMED2401 and 12 additional credit points of BMED240X) **Assessment:** One mid-semester practical quiz (in-class), one final theory exam, one final practical exam, Journal Club participation, Journal Club presentation and 1 individual written assignment **Practical field work:** Weekly 1.5 hour practical class **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of functional neuroanatomy and systems neuroscience, and an appreciation that neuroscience is a constantly evolving field. There will be a detailed exploration of the anatomical structures and pathways that underlie sensation and perception in each of the sensory modalities. The neural circutis and mechanisms that control somatic and autonomic motor systems, motivated behaviours, emotions, and other higher order functions will be explored in great detail based on current neuroscience literature. Practical classes will allow students to identify and learn the functions of critical anatomical structures in human brain and spinal corde specimens. Reading and interpreting images from functional ans tructural brain imaging techniques will be incorporated intot the neuroanatomy practical classes, and develop an appreciation of how these technologies can be used in neuroscience research. By undertaking the advanced unit students will participate in weekly small group seminars under the guidance of a research-active academic. The seminars will take the form of a Journal Club, a style practiced widely in research laboratories around the world. The aim of the Journal Club is to develop critical thinking and detailed knowledge in a specific area of neuroscience research through group discussions. The Journal Club will also develop the skills required to lead a discussion in a small group setting and construct a neuroscience review article. This unit will develop key attributes that are essential for science graduates as they move forward in their careers.

Textbooks

Nolte. Nolte's The Human Brain by Todd. Vanderah and Douglas Gould. 7th Ed, Elsevier, 2015
The Human Brain in Photographs and Diagrams by John Nolte. 4th Ed, Mosby, 2013

NEUR3006
Neural Information Processing

Credit points: 6 **Teacher/Coordinator:** A/Prof Bill Phillips **Session:** Semester 1 **Classes:** two lectures, 1 two-hour research paper session (journal club, 8 weeks) **Prerequisites:** PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X) **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3906 **Assessment:** one 2hr exam, 1500w essay, paper session oral presentation and participation marks, one prac report plus prac quizzes **Practical field work:** 1 x 3hour Prac (total of 5 such practical sessions) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit provides an introduction the mechanisms that drive neurons and neural circuits throughout the brain and body. The lectures explore how signal intensity is translated into nerve impulse codes and how this information is again translated through synapses to convey and interpret information about the external world, to control the body and to record information for future use (learning and memory). We also consider how sensory and motor information is integrated through neural circuits in the brain and spinal cord. Practical classes introduce some of the different ways in which the workings of the brain are studied. Each student chooses a journal club that focuses on a specific topic in neuroscience. In the weekly sessions, group members read, present and interpret original research papers, developing a deep understanding of the emerging scientific evidence in the topic area. This senior year unit of study will develop skills in critical analysis, interpretation and communication of new evidence.

Textbooks

Kandel, Schwartz, Jessel, Sigelbaum, Hudspeth. Principles of Neural Science. 5th Ed, Elsevier, NY, 2013

NEUR3906
Neural Information Processing (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dario Protti **Session:** Semester 1 **Classes:** 1 hour lectures per week **Prerequisites:** A mark of 75 or above in [PHSI2X05 or (BMED2401 and an additional 12 credit points of BMED240X)] **Prohibitions:** NEUR3001 or NEUR3901 or NEUR3002 or NEUR3902 or NEUR3006 **Assessment:** One 2hr exam, prac assessment consisting of one group poster presentation and two short MCQ quizzes, one advanced prac report, one written grant proposal (up to 2,000 words) and oral presentation of grant proposal. **Practical field work:** 1 x 3hour Prac (total of 6 such practical sessions) with the mainstream course and 3-4 x 3 hour advanced pracs. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit provides an introduction into the mechanisms that drive neurons and neural circuits throughout the brain and body. The lectures explore how signal intensity is translated into nerve impulse codes and how this information is again translated through synapses to convey and interpret information about the external world, to control the body and to record information for future use. We also consider how sensory and motor information is integrated through neural circuits in the brain and spinal cord. Practical classes introduce some of the different ways in which the workings of the brain are studied. This senior year unit of study will develop skills in critical analysis, interpretation and communication of new evidence.

Textbooks

Kandel, Schwartz, Jessel, Sigelbaum, Hudspeth. Principles of Neural Science. 5th Ed, Elsevier, NY, 2013

PCOL3022
Neuropharmacology

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prohibitions:** PCOL3922 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

PCOL3922
Neuropharmacology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prerequisites:** An annual average mark of 70 or above in the previous year **Prohibitions:** PCOL3022 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

PSYC3011
Learning and Behaviour

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** (PSYC2011 or PSYC2911 or PSYC2010 or PSYC2910) and PSYC2012 **Prohibitions:** PSYC3911 **Assessment:** One 2 hour exam, one 2000 word prac report, tutorial quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit addresses the fundamental concepts and more important research findings related to contemporary theories of associative learning in animals and humans. It examines the application of such fundamental research to issues such as drug use and food choice. It is designed to foster skills in reading primary sources in this area, and provide the opportunity for hands-on experience in carrying out a research project.

Textbooks

Bouton, M. E. (2016). Learning and Behavior: A contemporary synthesis, 2nd edition. Sunderland, MA: Sinauer.

PSYC3911
Learning and Behaviour (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** 2x 1-hr lectures and 1x 2-hr tutorial per week **Prerequisites:** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **Prohibitions:** PSYC3011 **Assessment:** One 2 hour exam, one 2500 word prac report, tutorial quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit addresses the fundamental concepts and more important research findings related to contemporary theories of associative learning in animals and humans. It examines the application of such fundamental research to issues such as drug use and food choice. It is designed to foster skills in reading primary sources in this area, and provide the opportunity for hands-on experience in carrying out a research project. In the advanced unit of study students will learn techniques to model learning and behaviour, and independently apply these skills to experimental data that they have collected.

Textbooks

Bouton, M. E. (2016). Learning and Behavior: A contemporary synthesis, 2nd edition. Sunderland, MA: Sinauer.

PSYC3012
Cognition, Language and Thought

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour practical per week. **Prerequisites:** PSYC2012 and PSYC2013 **Assessment:** One 2 hour exam, 2000 word practical report, practical exercise(s) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit extends the theories and methods of investigating memory and attentional processes discussed in PSYC2013 to consider a number of domains of higher cognitive processing. One strand of the course will focus on the cognitive processes involved in speech perception, language comprehension, language production, and reading. The remainder of the course will deal with the cognitive processes involved in reasoning and skill acquisition. The practical program will expose students to a variety of the research methods used to investigate higher cognitive processes, develop their understanding of how these methods can be used to investigate hypotheses about mental processes and consider applications of cognitive research to real-world problems and issues.

PSYC3013
Perceptual Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 2-hour tutorial per week. **Prerequisites:** (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and PSYC2012 **Prohibitions:** PSYC3913 **Assessment:** One 2-hour exam, one 2000 word report, tutorial quiz, group presentation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Perception poses many challenges: how do we see colour and movement? How do we perceive surfaces and materials? How does combining information from multiple senses improve our perception? This unit draws on behavioural and neurophysiological perspectives to deepen understanding of current research topics in perception. The emphasis is on how visual information is processed to accomplish functions such as perceiving a single edge, extracting the contours that form a face, or the spatial relations needed to call offside on the sports field. Students also gain conceptual tools for evaluating the empirical and theoretical worth of recent research in perception. During the tutorial component of the course students will develop a practical experiment in which they formulate and test a hypothesis. In this way students gain important research experience that gives them valuable insight into the scientific process as it exists both in professional work and in the empirical research project required for the Honours degree.

Textbooks

Sensation and Perception, Third Edition
Jeremy M. Wolfe, Keith R. Kluender, Dennis M. Levi, Linda M. Bartoshuk,Rachel S. Herz, Roberta L. Klatzky, Susan J. Lederman, and Daniel M.Merfeld

PSYC3913
Perceptual Systems (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** 2x 1-hr lectures and 1x 2-hr tutorial per week **Prerequisites:** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **Prohibitions:** PSYC3013 **Assessment:** One 2-hour exam, one 2000 word report, laboratory participation, group presentation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Perception poses many challenges: how do we see colour and movement? How do we perceive surfaces and materials? How does combining information from multiple senses improve our perception? This unit draws on behavioural and neurophysiological perspectives to deepen understanding of current research topics in perception. The emphasis is on how visual information is processed to accomplish functions such as perceiving a single edge, extracting the contours that form a face, or the spatial relations needed to call offside on the sports field. Students also gain conceptual tools for evaluating the empirical and theoretical worth of recent research in perception. During the tutorial component of the course students will develop a practical experiment in which they formulate and test a hypothesis. In this way students gain important research experience that gives them valuable insight into the scientific process as it exists both in professional work and in the empirical research project required for the Honours degree. In the advanced unit of study students will be placed in laboratories and will learn research techniques while helping conduct experiments in these laboratories.

Textbooks

Sensation and Perception, Third Edition

PSYC3014
Behavioural and Cognitive Neuroscience

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour practical per week. **Prerequisites:** [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **Prohibitions:** PSYC3914 **Assessment:** One 2 hour exam, one major essay/report 2000-2500 words, tutorial quizzes and participation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on approaches to studying neurosciences incorporating molecular, pre-clinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. The implications of focal cognitive deficits in neurological patients for models of normal cognitive function will also be explored. Specific topics to be covered will be selected from the following areas: sensorimotor integration and the neural and molecular basis of learning and memory, attention, language, visual cognition and praxis. In addition to lectures, a practical component will cover basic neuroanatomy and neuroscientific methods. The practical component will also introduce students to experimental and neuropsychological approaches to studying the relationahip between brain and behaviour.

PSYC3914
Behavioural and Cognitive Neuroscience Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Two lectures, one 1 hour tutorial and one 2 hour practical per week. **Prerequisites:** [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **Prohibitions:** PSYC3014 **Assessment:** One 2 hour exam (end of semester), one quiz (mid-semester), one presentation, one written assignment (lab report), attendance and participation in tutorial/practical exercises (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on approaches to studying neurosciences incorporating molecular, pre-clinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. Specific topics to be covered will be selected from the following areas: sensorimotor integration, and the neural and molecular basis of learning and memory, attention, language, visual cognition and praxis. The lecture material will be the same as for PSYC3014, however, the practical class is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. The practical component of the advanced stream will cover basic neuroanatomy, histology and neuropharmacology and will introduce students to experimental approaches to studying brain-behaviour relationships.

Table 1: Nutrition and Metabolism

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Nutrition and Metabolism			
For a major in Nutrition and Metabolism, the minimum requirement is 24 credit points from senior units of study listed in this subject area which must include NUTM3001 and NUTM3004.			
Junior units of study			
BIOL1006 **Life and Evolution**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996	Semester 1 Summer Main
BIOL1906 **Life and Evolution (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent. **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 *Note: Department permission required for enrolment*	Semester 1
BIOL1996 **Life and Evolution (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 *Note: Department permission required for enrolment*	Semester 1
BIOL1007 **From Molecules to Ecosystems**	6	**A** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **N** BIOL1907 or BIOL1997	Semester 2 Summer Main
BIOL1907 **From Molecules to Ecosystems (Advanced)**	6	**A** 85 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1997 *Note: Department permission required for enrolment*	Semester 2
BIOL1997 **From Molecules to Ecosystems (SSP)**	6	**A** 90 or above in HSC Biology or equivalent **N** BIOL1007 or BIOL1907 *Note: Department permission required for enrolment*	Semester 2
Intermediate units of study			
BCMB2001 **Biochemistry and Molecular Biology**	6	**P** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901	Semester 1
BCMB2901 **Biochemistry and Molecular Biology (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **N** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001	Semester 1
PHSI2005 **Integrated Physiology A**	6	**P** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PHSI2905 **Integrated Physiology A (Advanced)**	6	**P** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 1
PHSI2006 **Integrated Physiology B**	6	**P** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2906 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units is highly recommended for progression to Senior Physiology. It is recommended that PHSI2005 is completed before enrolling in PHSI2006.*	Semester 2
PHSI2906 **Integrated Physiology B (Advanced)**	6	**P** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **N** PHSI2006 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 *The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.*	Semester 2
Senior core units of study			
Students must complete both NUTM3001 and NUTM3004.			
NUTM3001 **Introductory Nutrition and Metabolism**	6	**A** PHSI2X05 and PHSI2X06 **P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
NUTM3004 **Metabolic Cybernetics**	6	**A** PHSI2X0X and (MATH1XX5 or ATHK1001) **P** [6cp from (BCHM2X72 or BCMB2X01) and 6cp from (BCHM2X71 or BCMB2X02 or DATA2002 or GEGE2X01 or MBLG2X7X or BIOL2XXX or PHSI2X0X)] OR (BMED2401 and BMED2405) **N** NUTM3002 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Senior elective units of study			
BCHM3071 Molecular Biology and Biochemistry-Genes	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3971 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3971 Molecular Biology and Biochem-Genes (Adv)	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3071 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3081 Mol Biology and Biochemistry-Proteins	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3981 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3981 Mol Biology and Biochem-Proteins (Adv)	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3081 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
BCHM3072 Human Molecular Cell Biology	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3972 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3972 Human Molecular Cell Biology (Advanced)	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3072 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3082 Medical and Metabolic Biochemistry	6	**P** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3982 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
BCHM3982 Medical and Metabolic Biochemistry (Adv)	6	**P** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **N** BCHM3082	Semester 2
PHSI3009 Frontiers in Cellular Physiology	6	**P** (PHSI2X05 and PHSI2X06) or (BMED2401 and an additional 12 credit points from BMED240X) **N** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3909 *We strongly recommend that students take both (PHSI3009 or PHSI3909) and (PHSI3010 or PHSI3910) units of study concurrently*	Semester 1
PHSI3909 Frontiers in Cellular Physiology (Adv)	6	**P** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **N** PHSI3009, PHSI3005, PHSI3905, PHSI3006, PHSI3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PHSI3010 Reproduction, Development and Disease	6	**P** (PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02, BIOL2X29, GEGE2X01)] or [12cp from (BMED2402, BMED2403, BMED2406)] **N** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3910 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PHSI3910 Reproduction, Development and Disease Adv	6	**P** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02 or BIOL2X29 or GEGE2X01)] or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **N** PHSI3010, PHSI3005, PHSI3905, PHSI3006, PHSI3906 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 1
PHSI3011 Frontiers in Whole Body Physiology	6	**P** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **N** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3911 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3911 Frontiers in Whole Body Physiology (Adv)	6	**P** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **N** PHSI3011, PHSI3007, PHSI3907, PHSI3008, PHSI3908 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3012 Physiology of Disease	6	**P** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **N** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3912 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2
PHSI3912 Physiology of Disease (Advanced)	6	**P** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **N** PHSI3012, PHSI3007, PHSI3907, PHSI3008, PHSI3908 *BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.*	Semester 2

Nutrition and Metabolism

For a major in Nutrition and Metabolism, the minimum requirement is 24 credit points from senior units of study listed in this subject area which must include NUTM3001 and NUTM3004.

Junior units of study

BIOL1006
Life and Evolution

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1, Summer Main **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1906 or BIOL1996 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals. By doing this unit of study, you will develop the ability to examine novel biological systems and understand the complex processes that have shaped those systems.

Textbooks
Please see unit outline on LMS

BIOL1906
Life and Evolution (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charlotte Taylor **Session:** Semester 1 **Classes:** Two lectures per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1996 **Assumed knowledge:** 85 or above in HSC Biology or equivalent. **Assessment:** Practical and communication (40%), during semester exams (20%), summative final exam (40%) **Practical field work:** 11 x 3-hour lab classes, a field excursion **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, proteins) to whole ecosystems in which myriads of species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. This unit explores how new species continue to arise while others go extinct and discusses the role of mutations as the raw material on which selection acts. It explains how information is transferred between generations through DNA, RNA and proteins, transformations which affect all aspects of biological form and function. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. You will participate in inquiry-led practical classes investigating single-celled organisms and the diversity of form and function in plants and animals.

Life and Evolution (Advanced) has the same overall structure as BIOL1006 but material is discussed in greater detail and at a more advanced level. Students enrolled in BIOL1906 participate in a research project with a focus on developing skills in critical evaluation, experimental design, data analysis and communication.

Textbooks
Please see unit outline on LMS

BIOL1996
Life and Evolution (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Mark de Bruyn **Session:** Semester 1 **Classes:** Lectures as per BIOL1906; one 3-hour practical per week **Prohibitions:** BIOL1001 or BIOL1911 or BIOL1991 or BIOL1006 or BIOL1906 or BIOL1993 or BIOL1998 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), practical reports (25%), seminar presentation (15%), lab note book (5%), prelaboratory quizzes (5%) **Practical field work:** null **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Biology is an immensely diverse science. Biologists study life at all levels, from the fundamental building blocks (genes, and proteins) to whole ecosystems in which myriad species interact. Evolution is the unifying concept that runs through the life sciences, from the origin and diversification of life to understanding behaviour, to dealing with disease. Evolution through natural selection is the framework in biology in which specific details make sense. Science builds and organises knowledge of life and evolution in the form of testable hypotheses. The practical work syllabus for BIOL1996 is different from that of BIOL1906 (Advanced) and consists of a special project-based laboratory.

Textbooks
Please see unit outline on LMS
Bromham, L 2015, An Introduction to Molecular Evolution and Phylogenetics, Oxford University Press.

BIOL1007
From Molecules to Ecosystems

Credit points: 6 **Teacher/Coordinator:** Dr Emma Thompson **Session:** Semester 2, Summer Main **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1907 or BIOL1997 **Assumed knowledge:** HSC Biology. Students who have not completed HSC Biology (or equivalent) are strongly advised to take the Biology Bridging Course (offered in February). **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative final exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . You will participate in inquiry-led practicals that reinforce the concepts in the unit. By doing this unit you will develop knowledge and skills that will enable you to play a role in finding global solutions that will impact our lives.

Textbooks
Please see unit outline on LMS

BIOL1907
From Molecules to Ecosystems (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Pauline Ross **Session:** Semester 2 **Classes:** Two lectures per week and online material and 12 x 3-hour practicals **Prohibitions:** BIOL1007 or BIOL1997 **Assumed knowledge:** 85 or above in HSC Biology or equivalent **Assessment:** Quizzes (10%), communication assessment (40%), skills tests (10%), summative exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and discover how expanding tools have improved our capacity to manage and intervene in ecosystems for our own health and organisms in the environment that surround and support us . This unit of study has the same overall structure as BIOL1007 but material is discussed in greater detail and at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Please see unit outline on LMS

BIOL1997
From Molecules to Ecosystems (SSP)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 2 **Classes:** Two lectures per week and online material **Prohibitions:** BIOL1007 or BIOL1907 **Assumed knowledge:** 90 or above in HSC Biology or equivalent **Assessment:** One 2-hour exam (50%), project report which includes written report and presentation (50%) **Practical field work:** As advised and required by the project; approximately 30-36 hours of research project in the laboratory or field **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Paradigm shifts in biology have changed the emphasis from single biomolecule studies to complex systems of biomolecules, cells and their interrelationships in ecosystems of life. Such an integrated understanding of cells, biomolecules and ecosystems is key to innovations in biology. Life relies on organisation, communication, responsiveness and regulation at every level. Understanding biological mechanisms, improving human health and addressing the impact of human activity are the great challenges of the 21st century. This unit will investigate life at levels ranging from cells, and biomolecule ecosystems, through to complex natural and human ecosystems. You will explore the importance of homeostasis in health and the triggers that lead to disease and death. You will learn the methods of cellular, biomolecular, microbial and ecological investigation that allow us to understand life and intervene in ecosystems to improve health. The same theory will be covered as in the advanced stream but in this Special Studies Unit, the practical component is a research project. The research will be either a synthetic biology project investigating genetically engineered organisms or organismal/ecosystems biology. Students will have the opportunity to develop higher level generic skills in computing, communication, critical analysis, problem solving, data analysis and experimental design.

Textbooks

Please see unit outline on LMS

Intermediate units of study

BCMB2001
Biochemistry and Molecular Biology

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three lectures/tutorials per week ; one 4-hour practical session per fortnight **Prerequisites:** 6cp of (BIOL1XX7 or MBLG1XXX) and 6cp of CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2901 **Assessment:** Assignments, skills-based assessment, quizzes, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. Our practicals, along with other guided and online learning sessions will introduce you to widely applied and cutting edge tools that are essential for modern biochemistry and molecular biology. By the end of this unit you will be equipped with foundational skills and knowledge to support your studies in the life and medical sciences.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

BCMB2901
Biochemistry and Molecular Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Dale Hancock **Session:** Semester 1 **Classes:** Three 1-hour lectures/tutorials per week; one 4-hour practical per fortnight **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) and CHEM1XX1 **Prohibitions:** BCHM2072 or BCHM2972 or MBLG2071 or MBLG2971 or BMED2405 or BCMB2001 **Assessment:** Assignments, quiz, skills-based assessment, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Without cells, life as we know it would not exist. These dynamic assemblies, packed with biological molecules are constantly in action. But how do cells work? Why is the food that you eat so important for cellular function? How is information transmitted from generation to generation? And, what happens as a result of disease or genetic mutation? In this unit of study you will learn how cells work at the molecular level, with an emphasis on human biochemistry and molecular biology. We will focus initially on cellular metabolism and how cells extract and store energy from fuels like fats and carbohydrates, how the use of fuels is modulated in response to exercise, starvation and disease, and how other key metabolites are processed. Then we will explore how genetic information is regulated in eukaryotes, including replication, transcription and translation, and molecular aspects of the cell cycle, mitosis and meiosis. The advanced laboratory component will provide students with an authentic research laboratory experience while in the theory component, current research topics will be presented in a problem-based format through dedicated advanced tutorial sessions. This material will be assessed by creative student-centered activities supported by eLearning platforms.

Textbooks

Lehninger Principles of Biochemistry 7th edition (2016) David L. Nelson Michael M. Cox Macmillan (ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6)

PHSI2005
Integrated Physiology A

Credit points: 6 **Teacher/Coordinator:** Dr Michael Morris **Session:** Semester 1 **Classes:** Three 1 hour lectures per week. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2905 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual written assessments, and quizzes (100%) **Practical field work:** One 3 hour practical or one 3 hour tutorial per week. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study offers an introduction to the basic concepts underpinning physiology, excitable cell (nerve and muscle) physiology, as well as the functions of the nervous system (central processing, and sensory and motor systems). It also incorporates cardiovascular and exercise physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Tutorial sessions develop critical thinking, the integrative nature of physiology, and generic skills in scientific writing and presentation. The practicals and tutorials also emphasise group learning and team work.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 7th edition. 2015. ISBN-10: 0321981227; ISBN-13: 978-0321981226 (International Edition)

PHSI2905

Integrated Physiology A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 1 **Classes:** Five 1 hour lectures, one 3 hour practical and one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. Students will also be exempt from all Inquiry-based learning tutorials. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2005 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2005 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2005. This unit of study offers a basic introduction to the functions of the nervous system, excitable cell (nerve and muscle) physiology, sensory and motor systems, and central processing. It also incorporates haematology and cardiovascular physiology. The practical component involves experiments on humans and isolated tissues, with an emphasis on hypothesis generation and data analysis. Inquiry-based learning sessions develop critical thinking and generic skills while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2010. ISBN 10:0-321-1750071; ISBN 13:978-0-321-750075 (International Edition).

PHSI2006

Integrated Physiology B

Credit points: 6 **Teacher/Coordinator:** Dr Bronwyn McAllan **Session:** Semester 2 **Classes:** Three 1 hour lectures per week, and one 3 hour practical or one 3 hour tutorial per week. There will be one 4 hour practical session. **Prerequisites:** 6cp from CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2906 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** Two written exams; group and individual written and oral presentations (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units is highly recommended for progression to Senior Physiology. It is recommended that PHSI2005 is completed before enrolling in PHSI2006.

This unit of study offers a basic introduction to the functions of the remaining body systems: gastrointestinal, respiratory, haematology, endocrine, reproductive and renal. The practical component involves experiments on humans and computer simulations, with an emphasis on hypothesis generation and data analysis. The tutorial sessions develop critical thinking and graduate attributes while demonstrating the integrative nature of physiology. Oral and written communication skills are emphasized, as well as group learning and team work.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2012. ISBN-10: 0321750071. ISBN-13: 978-0321750075.

PHSI2906

Integrated Physiology B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Atomu Sawatari **Session:** Semester 2 **Classes:** Three 1 hour lectures per week, and one 3 hour practical and/or one 3 hour tutorial per fortnight. Advanced students will be required to attend the designated Advanced Practical and Tutorial sessions. **Prerequisites:** A mark of 75 or above in CHEM1XXX or (BIOL1XX7 or MBLG1XX1) **Prohibitions:** PHSI2006 or BMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assessment:** One written exam; individual and group oral presentations, 2 practical reports (reports will replace some other assessment items from regular course) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The completion of 6 credit points of MBLG units of study is highly recommended for progression to Senior Physiology.

This unit of study is an extension of PHSI2006 for talented students with an interest in Physiology and Physiological research. The lecture component of the course is run in conjunction with PHSI2006. This unit of study gives a basic introduction to the remaining of the body systems: gastrointestinal, respiratory, endocrine, reproductive and renal. The practical component involves simple experiments on humans, isolated tissues, and computer simulations, with an emphasis on hypothesis generation and data analysis. Both oral and written communication skills are emphasised, as well as group learning. The course will provide an opportunity for students to apply and extend their understanding of physiological concepts by designing and conducting actual experiments. Small class sizes will provide a chance for students to interact directly with faculty members mentoring the practical sessions. Assessment for this stream will be based on oral group presentations and two practical reports. These items will replace some other assessable activities from the regular course.

Textbooks

Dee Unglaub Silverthorn. Human Physiology: An Integrated Approach, 6th edition. 2012. ISBN 10:0-321-750071; ISBN 13:978-0-321-750075 (International Edition).

Senior core units of study

Students must complete both NUTM3001 and NUTM3004.

NUTM3001

Introductory Nutrition and Metabolism

Credit points: 6 **Teacher/Coordinator:** Wendy Stuart-Smith **Session:** Semester 1 **Classes:** Two lectures, one tutorial per week, 1-5hour laboratory/presentation class most weeks **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Assumed knowledge:** PHSI2X05 and PHSI2X06 **Assessment:** In semester reports, presentations and quizzes (40%) one 2.5-hour exam (60%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Nutrition is a multidisciplinary science that covers the role of food in health and disease. Advances in biomolecular science have increased the focus of nutrition on the metabolic pathways that transform nutrients. This unit of study aims to explore fundamentals in nutritional science to develop an understanding of the core concepts in human nutrition through exploring the role of macro- and micro-nutrients and their interaction across the lifespan, mostly in the healthy individual. The focus will be the biochemical reactions that take place in cells, how these are influenced by different nutrients and what are the implications for the whole body. This unit of study will consider the structure and chemical characteristics of nutrients, their metabolism, and their roles in health and disease. This unit of study will explore how animal models, cell culture techniques and human trials have contributed to advancing nutritional science. Examples from current research will be used to illustrate how nutrients are metabolised, mostly in health, and the expanding scope of research in human nutrition.

Textbooks

Essentials of Human Nutrition 4th Edition, 2012. Edited by Jim Mann and A. Stewart Truswell. Oxford University Press. ISBN: 9780199566341*

NUTM3004
Metabolic Cybernetics

Credit points: 6 **Teacher/Coordinator:** Dr Kim Bell-Anderson **Session:** Semester 2 **Classes:** Two lectures, one tutorial, 3-hour practical per week on average **Prerequisites:** [6cp from (BCHM2X72 or BCMB2X01) and 6cp from (BCHM2X71 or BCMB2X02 or DATA2002 or GEGE2X01 or MBLG2X7X or BIOL2XXX or PHSI2X0X)] OR (BMED2401 and BMED2405) **Prohibitions:** NUTM3002 **Assumed knowledge:** PHSI2X0X and (MATH1XX5 or ATHK1001) **Assessment:** One 1.5-hour exam (40%), 1000w essay (20%), data exercises (10%), research project (30%, includes multimedia group work (10%), presentation group work (10%), 500w student reflection (5%), mentor assessment (5%) **Practical field work:** null **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

Obesity is a worldwide health problem driven by a complex intersection between genetics and the environment. This interdisciplinary unit of study aims to explore recent advances in 'omics' technology and big data analysis. The focus will be on how to tackle highly complex questions such as why some individuals become obese and others don't. The problem will be presented from a range of scientific points of view so that students will be able to understand the contextual nature of bringing multiple disciplines to bear on a really important biological problem. Students will be provided a research training opportunity to contribute to our understanding of the relevant problems of over-nutrition in our society. Collaborative research is supported by lectures and tutorials on nutrition science, 'big data' management strategies and approaches to data analysis.

Senior elective units of study

BCHM3071
Molecular Biology and Biochemistry-Genes

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3971 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester practical work and assignments (30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3971
Molecular Biology and Biochem-Genes (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Hannah Nicholas **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3071 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the activity of genes in living organisms, with a focus on eukaryotic and particularly human systems. The lecture component covers the arrangement and structure of genes, how genes are expressed, promoter activity and enhancer action. This leads into discussions on the biochemical basis of differentiation of eukaryotic cells, the molecular basis of imprinting, epigenetics, and the role of RNA in gene expression. Additionally, the course discusses the effects of damage to the genome and mechanisms of DNA repair. The modern techniques for manipulating and analysing macromolecules such as DNA and proteins and their relevance to medical and biotechnological applications are discussed. Techniques such as the generation of gene knockout and transgenic mice are discussed as well as genomic methods of analysing gene expression patterns. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of genes within the human genome. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology laboratories.

The lecture component of this unit of study is the same as BCHM3071. Qualified students will attend seminars/practical classes in which more sophisticated topics in gene expression and manipulation will be covered.

Textbooks

Lewin, B. Genes XI. 11th edition. Jones and Bartlett. 2014.

BCHM3081
Mol Biology and Biochemistry-Proteins

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Prof Joel Mackay **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3981 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the functions of proteins in living organisms, with a focus on eukaryotic and particularly human systems. Its lecture component deals with how proteins adopt their biologically active forms, including discussions of protein structure, protein folding and how recombinant DNA technology can be used to design novel proteins with potential medical or biotechnology applications. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of proteins. It also covers physiologically and medically important aspects of proteins in living systems, including the roles of chaperones in protein folding inside cells, the pathological consequences of misfolding of proteins, how proteins are sorted to different cellular compartments and how the biological activities of proteins can be controlled by regulated protein degradation. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology and protein biochemistry laboratories.

Textbooks

Williamson M. How Proteins Work. Garland. 2012.

BCHM3981
Mol Biology and Biochem-Proteins (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Prof Joel Mackay **Session:** Semester 1 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3081 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study is designed to provide a comprehensive coverage of the functions of proteins in living organisms, with a focus on eukaryotic and particularly human systems. Its lecture component deals with how proteins adopt their biologically active forms, including discussions of protein structure, protein folding and how recombinant DNA technology can be used to design novel proteins with potential medical or biotechnology applications. Particular emphasis is placed on how modern molecular biology and biochemical methods have led to our current understanding of the structure and functions of proteins. It also covers physiologically and medically important aspects of proteins in living systems, including the roles of chaperones in protein folding inside cells, the pathological consequences of misfolding of proteins, how proteins are sorted to different cellular compartments and how the biological activities of proteins can be controlled by regulated protein degradation. The practical course is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in molecular biology and protein biochemistry laboratories.

The lecture component of this unit of study is the same as BCHM3081. Qualified students will attend seminars/practical classes in which more sophisticated topics in protein biochemistry will be covered.

Textbooks

Williamson M. How Proteins Work. Garland. 2012.

BCHM3072
Human Molecular Cell Biology

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3972 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BCHM3972
Human Molecular Cell Biology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, Dr Markus Hofer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3072 **Assessment:** One 2.5-hour exam (theory and theory of prac 70%), in-semester (practical work and assignments 30%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the responses of cells to changes in their environment in both health and disease. The lecture course consists of four integrated modules. The first will provide an overview of the role of signalling mechanisms in the control of human cell biology and then focus on cell surface receptors and the downstream signal transduction events that they initiate. The second will examine how cells detect and respond to pathogenic molecular patterns displayed by infectious agents and injured cells by discussing the roles of relevant cell surface receptors, cytokines and signal transduction pathways. The third and fourth will focus on the life, death and differentiation of human cells in response to intra-cellular and extra-cellular signals by discussing the eukaryotic cell cycle under normal and pathological circumstances and programmed cell death in response to abnormal extra-cellular and intra-cellular signals. In all modules emphasis will be placed on the molecular processes involved in human cell biology, how modern molecular and cell biology methods have led to our current understanding of them and the implications of them for pathologies such as cancer. The practical component is designed to complement the lecture course, providing students with experience in a wide range of techniques used in modern molecular cell biology.

The lecture component of this unit of study is the same as BCHM3072. Qualified students will attend seminars/practical classes in which more sophisticated topics in modern molecular cell biology will be covered.

Textbooks

Alberts, B. et al. Molecular Biology of the Cell. 6th edition. Garland Science. 2014.

BCHM3082
Medical and Metabolic Biochemistry

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and BMED2405 and 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3982 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with molecular biology methods and studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry.

BCHM3982
Medical and Metabolic Biochemistry (Adv)

Credit points: 6 **Teacher/Coordinator:** Jill Johnston, A/Prof Gareth Denyer **Session:** Semester 2 **Classes:** Two 1-hour lectures per week; two 3-hours practicals per fortnight **Prerequisites:** [An average mark of 75 in 12cp from (BCHM2X71 or BCHM2X72 or BCMB2X01 or BCMB2X02 or MBLG2X71)] OR [BMED2401 and a mark of 75 or above in BMED2405 and a mark of 75 or above in 6cp from (BCHM2X71 or BCMB2X02 or MBLG2X71)] **Prohibitions:** BCHM3082 **Assessment:** One 2.5-hour exam (theory and theory of prac 65%), in-semester (practical work and assignments 35%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will explore the biochemical processes involved in the operation of cells and how they are integrated in tissues and in the whole human body in normal and diseased states. These concepts will be illustrated by considering whole-body aspects of energy utilisation, fat and glycogen storage and their regulation under normal conditions compared to obesity and diabetes. Key concepts that will be discussed include energy balance, regulation of metabolic rate, control of food intake, tissue interactions in fuel selection, the role of adipose tissue and transport of fuel molecules from storage organs and into cells. Particular emphasis will be placed on how the modern concepts of metabolomics, coupled with new methods, including magnetic resonance techniques and molecular biology methods, as well as studies of the structure and function of enzymes, have led to our current understanding of how metabolic processes are normally integrated and how they become deranged in disease states. The practical component is designed to complement the lecture course and will provide students with experience in a wide range of techniques used in modern medical and metabolic biochemistry. Qualified students will attend some lectures/practical classes in common with BCHM3082 and some separate lectures/ practical classes in which more sophisticated topics in metabolic biochemistry will be covered.

PHSI3009
Frontiers in Cellular Physiology

Credit points: 6 **Teacher/Coordinator:** A/Prof Anuwat Dinudom **Session:** Semester 1 **Classes:** 2 x 1hr/ week lectures and 6 x 2 hr large class tutorials (PBL) per semester **Prerequisites:** (PHSI2X05 and PHSI2X06) or (BMED2401 and an additional 12 credit points from BMED240X) **Prohibitions:** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3909 **Assessment:** four in-class quizzes, one mid-semester exam, one 2hr final exam, two presentations for problem-based learning and 1 practical class report **Practical field work:** 3 x 4 hr practicals per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: We strongly recommend that students take both (PHSI3009 or PHSI3909) and (PHSI3010 or PHSI3910) units of study concurrently

The aim of this unit is to provide students with advanced knowledge of cellular physiology. There will be a detailed exploration of the signals and pathways cells use to detect and respond to environmental changes and cues. Important signalling systems and homeostatic regulators will be discussed in the context of biological processes and human diseases. Problem-based learning sessions will explore these diseases with student-led teaching. Practical classes will explore physiological techniques for investigating cell signalling and the biophysical properties of cells. Large class tutorials will focus on graduate attribute skills development in the context of reinforcing material discussed in the lectures and practical classes. This unit will develop key attributes that are essential for a science graduate as they move forward in their careers.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3909
Frontiers in Cellular Physiology (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Anuwat Dinudom **Session:** Semester 1 **Classes:** 2 x 1hr/ week lectures and 3 x 2 hrs large class tutorials (PBL) per semester **Prerequisites:** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **Prohibitions:** PHSI3009, PHSI3005, PHSI3905, PHSI3006, PHSI3906 **Assessment:** four in-class quizzes, one mid-semester exam, one 2hr final exam, one presentations for problem-based learning and one Advanced research report **Practical field work:** 3 x 4 hr practicals per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of cellular physiology. There will be a detailed exploration of the signals and pathways cells use to detect and respond to environmental changes and cues. Important signalling systems and homeostatic regulators will be discussed in the context of biological processes and human diseases. Problem-based learning sessions will explore these diseases with student-led teaching. Practical classes will explore physiological techiques for investigating cell signalling and biophysical properties of cells. Large class tutorials will focus on graduate attribute skills development in the context of reinforcing material discussed in the lectures and practical classes. This unit will develop key attributes that are essential for science a graduate as they move forward in their careers.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3010
Reproduction, Development and Disease

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 1 **Classes:** 2 x 1hr lectures per week; 1 guest lecture/problem-based learning class introduction/organisation session per week. 2 x 3 hour problem-based learning classes per semester. **Prerequisites:** (PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02, BIOL2X29, GEGE2X01)] or [12cp from (BMED2402, BMED2403, BMED2406)] **Prohibitions:** PHSI3905, PHSI3906, PHSI3005, PHSI3006, PHSI3910 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, two problem-solving learning tutorials, 3 practical class reports **Practical field work:** 3 x 3 hr practicals per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of the physiological processes that regulate normal and how these may go awry leading to significant human conditions or even disease. Lectures will focus on; male and female reproductive physiology, endocrinology of reproduction, physiology of fertilisation, cell cycle control and apoptosis, mechanisms of differentiation, gastrulation, cardiovascular development, tissue formation and organogenesis, stem cell biology and the link between developmental processes and cancer. Reprogramming and tissue regeneration will also feature in the lecture content. Problem-based learning will focus on reproductive physiology and regeneration. Practical classes will examine the processes regulating sperm function, embryogenesis and stem cell biology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3910
Reproduction, Development and Disease Adv

Credit points: 6 **Teacher/Coordinator:** Dr Stuart Fraser **Session:** Semester 1 **Classes:** 2 x 1hr lectures per week; 1 guest lecture/problem-based learning class introduction/organisation session per week; 2 x 3 hour stem cell laboratory presentations per semester. **Prerequisites:** A mark of 75 or above in {(PHSI2X05 and PHSI2X06) or [12cp from (BCMB2X02 or BIOL2X29 or GEGE2X01)] or [12cp from (BMED2402 or BMED2403 or BMED2406)]} **Prohibitions:** PHSI3010, PHSI3005, PHSI3905, PHSI3006, PHSI3906 **Assessment:** one mid-semester MCQ exam, one 2hr final exam,stem cell labortory class (2 presentations), 3 practical class reports **Practical field work:** 4 x 4 hr practicals per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of the physiological processes that regulate normal and how these may go awry leading to significant human conditions or even disease. Lectures will focus on; male and female reproductive physiology, endocrinology of reproduction, physiology of fertilisation, cell cycle control and apoptosis, mechanisms of differentiation, gastrulation, cardiovascular development, tissue formation and organogenesis, stem cell biology and the link between developmental processes and cancer. Reprogramming and tissue regeneration will also feature in the lecture content. . Practical classes will examine the processes regulating sperm function, embryogenesis and stem cell biology. Students enrolling in PHSI3910 complete a separate laboratory class centered on stem cell differentiation to replace the problem-based learning exercises in PHSI3010.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3011
Frontiers in Whole Body Physiology

Credit points: 6 **Teacher/Coordinator:** Prof Phillip Poronnik **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 4 x 2 hr class tutorials per semester (Week 3 and 13) and 2 x 1 hr tutorial preparation session (week 2 and 12), one contcept based learning tutorial 3 x 2 hours **Prerequisites:** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **Prohibitions:** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3911 **Assessment:** one mid-semester exam, one 2hr final exam, two tutorial reports, 3 practical class reports **Practical field work:** 3 x 4 hr practicals per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate homeostasis throughout the whole body with a particular focus not only on the interplay between major organ systems, but also variability amongst individuals. The emphasis in this unit is on recent advances at the frontiers of human physiology. Our current understandings of how we functions will be explored at the molecular, cellular and whole body level. This is detailed fundamental knowledge that is key to understanding the transitions that occur from health to disease. Hands on practical classes will explore the physiology presented in the lectures and tutorial sessions will investigate what 'normal' is in terms of whole body physiology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science; Siverthorn D, Human Physiology: an integrated approach. 7th Edition Pearson.

PHSI3911
Frontiers in Whole Body Physiology (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Phillip Poronnik **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 4 x 2 hr class tutorials per semester (Week 3 and 13) and 2 x 1 hr tutorial preparation session (week 2 and 12), one contcept based learning tutorial 3 x 2 hours **Prerequisites:** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **Prohibitions:** PHSI3011, PHSI3007, PHSI3907, PHSI3008, PHSI3908 **Assessment:** one mid-semester exam, one 2hr final exam, two tutorial reports, 3 practical class reports **Practical field work:** 3 x 4 hr practicals per semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate homeostasis throughout the whole body with a particular focus not only on the interplay between major organ systems, but also variability amongst individuals. The emphasis in this unit is on recent advances at the frontiers of human physiology. Our current understandings of how we functions will be explored at the molecular, cellular and whole body level. This is detailed fundamental knowledge that is key to understanding the transitions that occur from health to disease. Hands on practical classes will explore the physiology presented in the lectures and tutorial sessions will investigate what Â¿normalÂ¿ is in terms of whole body physiology.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science; Siverthorn D, Human Physiology: an integrated approach. 7th Edition Pearson.

PHSI3012
Physiology of Disease

Credit points: 6 **Teacher/Coordinator:** A/Prof Matthew Naylor **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 12 x 1hr tutorials (weeks 3-5 and 8-10 only), 2 x 6hr practical (weeks 4-5 and 8-9). **Prerequisites:** (PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402) **Prohibitions:** PHSI3007, PHSI3008, PHSI3907, PHSI3908, PHSI3912 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, two problem-solving learning tutorials, 2 practical class reports **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate normal homeostasis throughout the whole body and how defects in these processes can lead to significant human disease. The emphasis in this unit is on recent advances at the frontiers of human physiology. The processes leading to cancer, cardiovascular and metabolic disease will be explored at the molecular, cellular and whole body level. Problem-based learning will focus on cancer and cardiovascular disease and practical classes will utilise both wet lab and online resources to dissect the processes by which normal physiological processes become aberrant leading to human disease.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

PHSI3912
Physiology of Disease (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Matthew Naylor **Session:** Semester 2 **Classes:** 2 x 1hr lectures, 2 x 6hr practical (weeks 4-5 and 8-9), Advanced project. **Prerequisites:** A mark of 75 or above in [(PHSI2X05 and PHSI2X06) or (BMED2401 and BMED2402)] **Prohibitions:** PHSI3012, PHSI3007, PHSI3907, PHSI3008, PHSI3908 **Assessment:** one mid-semester MCQ exam, one 2hr final exam, Advanced project report, 2 practical class reports **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: BMedSc degree students: You must have successfully completed BMED2401 and an additional 12cp from BMED240X before enrolling in this unit.

The aim of this unit is to provide students with advanced knowledge of whole body physiology. Lectures will provide insight into the mechanisms that regulate normal homeostasis throughout the whole body and how defects in these processes can lead to significant human disease. The emphasis in this unit is on recent advances at the frontiers of human physiology. The processes leading to cancer, cardiovascular and metabolic disease will be the specific will be explored at the molecular, cellular and whole body level. Students will undertake an Advanced Project Problem-based learning will focus on cancer and cardiovascular disease and Practical classes will utilise both wet lab and online resources to dissect the processes by which normal physiological processes become aberrant leading to human disease.

Textbooks

Alberts, B. Molecular Biology of the Cell. 5th edition. Garland Science

Table 1: Pharmacology

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Pharmacology			
For a major in Pharmacology, the minimum requirement is 24 credit points from senior units of study listed in this subject area.			
Intermediate units of study			
PCOL2011 **Pharmacology Fundamentals**	6	**A** BIOL1XXX or MBLG1XX1 **P** 6cp from CHEM1XXX **N** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808	Semester 1
PCOL2012 **Pharmacology: Drugs and People**	6	**A** (BIOL1XXX or MBLG1XX1) and PCOL2011 **P** 6cp from CHEM1XXX **N** PCOL2555	Semester 2
Senior units of study			
PCOL3011 **Toxicology**	6	**P** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **N** PCOL3911	Semester 1
PCOL3911 **Toxicology (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **N** PCOL3011	Semester 1
PCOL3012 **Drug Design and Development**	6	**P** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **N** PCOL3912	Semester 1
PCOL3912 **Drug Design and Development (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **N** PCOL3012	Semester 1
PCOL3021 **Drug Therapy**	6	**P** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **N** PCOL3921	Semester 2
PCOL3921 **Drug Therapy (Advanced)**	6	**P** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] **N** PCOL3021	Semester 2
PCOL3022 **Neuropharmacology**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **N** PCOL3922	Semester 2
PCOL3922 **Neuropharmacology (Advanced)**	6	**A** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **P** An annual average mark of 70 or above in the previous year **N** PCOL3022	Semester 2

Pharmacology

For a major in Pharmacology, the minimum requirement is 24 credit points from senior units of study listed in this subject area.

Intermediate units of study

PCOL2011
Pharmacology Fundamentals

Credit points: 6 **Teacher/Coordinator:** Dr Hilary Lloyd **Session:** Semester 1 **Classes:** Lectures (2 x1 hr per week); wet and dry labs (5 x4 hrs), data anaylsis tutorials (2 x 2 hrs); workshops (6 x 2 hrs) **Prerequisites:** 6cp from CHEM1XXX **Prohibitions:** PCOL2555 orBMED2401 or BMED2402 or BMED2403 or BMED2404 or BMED2405 or BMED2406 or BMED2801 or BMED2802 or BMED2803 or BMED2804 or BMED2805 or BMED2806 or BMED2807 or BMED2808 **Assumed knowledge:** BIOL1XXX or MBLG1XX1 **Assessment:** In-semester (40%), which consists of 4 x on-line quizzes, 2 x lab reports, 3 x research topics, 1 x oral presentation, end-of-semester examination (60%), which consists of multiple choice and short answer questions **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides the fundamental grounding in four basic areas in Pharmacology: (1) principles of drug action (2) pharmacokinetics and drug metabolism (3) experimental design and autonomic pharmacology, and (4) drug design. The delivery of material involves lectures, practicals, computer-aided learning and problem-based workshops. Practical classes provide students with the opportunity of acquiring technical experience and teamwork skills. Problem-based workshops are based on real-life scenarios of drug use in the community. These workshops require students to integrate information obtained in lectures in order to provide solutions to the problems. Online quizzes accompany each module and are to encourage continued learning throughout the semester.

Textbooks

Rang and Dale's Pharmacology, 8th Edition. H. P. Rang, J. M. Ritter, R. J. Flower, and G. Henderson, (Elsevier 2016). Medical Pharmacology at a Glance, 7th edn M.J. Neal: (Blackwell Scientific Publications, 2012).

PCOL2012
Pharmacology: Drugs and People

Credit points: 6 **Teacher/Coordinator:** Dr Hilary Lloyd **Session:** Semester 2 **Classes:** Lectures (2x1 hr per week); wet and dry labs (5 x 4 hrs), data analysis tutorials (2 x 2 hrs); workshops (6 x 2 hrs) **Prerequisites:** 6cp from CHEM1XXX **Prohibitions:** PCOL2555 **Assumed knowledge:** (BIOL1XXX or MBLG1XX1) and PCOL2011 **Assessment:** In-semester (40%), which consists of 4 x on-line quizzes, 2 x lab reports, 3 x research topics, 1 x oral presentation, end-of-semester examination (60%), which consists of multiple choice and short answer questions **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines four important areas of Pharmacology: (1) Principles of drug action in the nervous system; (2) Drug abuse, addiction and analgesia; (3) Drug treatment of allergies and GI disorders; (4) Introduction to drug discovery and development. The delivery of material involves lectures, practicals, computer-aided learning and problem-based workshops. Practical classes provide students with the opportunity of acquiring technical experience and teamwork skills. Problem-based workshops are based on real-life scenarios of drug use in the community. These workshops require students to apply information obtained in lectures and readings in order to 'solve' the problems. Workshop activities will include oral presentations.

Textbooks

Rang and Dale's Pharmacology, 8th Edition. H. P. Rang, J. M. Ritter, R. J. Flower, and G. Henderson, (Elsevier 2015). Medical Pharmacology at a Glance, 7th edn M.J. Neal: (Blackwell Scientific Publications, 2012).

Senior units of study

PCOL3011
Toxicology

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every 2 weeks and two practical sessions each 3 hours in length. **Prerequisites:** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **Prohibitions:** PCOL3911 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the discipline of toxicology. The study of toxicology is central to the assessment of drug safety in drug development and in the explanation of toxicology associated with registered drugs (adverse drug reactions) and drug-drug interactions. These issues as well as the pharmacogenetic basis of adverse reactions will be considered. Environmental toxicology, particularly toxic reactions to environmental agents such as asbestos and pesticides, and target organ toxicology (lung, liver, CNS) are also covered. The diverse world of plants and animal toxins will also be explored. As a final consequence of exposure to many toxicants, the biology and causes of cancer are discussed. As part of the unit students are introduced to basic ideas about the collection and analysis of data from human and animal populations, both in the structured situation of clinical trials, forensic problems and in analysis of epidemiological data.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 2 ed. McGraw Hill. 2010, or, by the same authors: Toxicology: The Basic Science of Poisons. 7 ed. McGraw Hill. 2008.

PCOL3911
Toxicology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 1 **Classes:** Two 1 hour lectures per week and one 3 hour tutorial/practical every second week. and two practical sessions each 3 hours in length **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] **Prohibitions:** PCOL3011 **Assessment:** One 2 hour exam, tutorial presentations, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3011. Students will be set special advanced assignments and additional practical data management activities related to the material covered in lectures and practical work. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Klaasen, Curtis D. Casarett and Doull's Essentials of Toxicology 3rd ed. McGraw Hill. 2015.. or, by the same authors: Toxicology: The Basic Science of Poisons. 8th ed. McGraw Hill. 2013.

PCOL3012
Drug Design and Development

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** [PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X)] or 12 credit points of BCMB2XXX **Prohibitions:** PCOL3912 **Assessment:** One 2 hour exam, class and online quizzes, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to introduce students with a basic understanding of pharmacology to the field of medicinal chemistry associated with drug design and development. The course covers the fundamental aspects of drug discovery and development with reference to the essentials of chemistry and illustrates drug development with examples that include neuraminidase inhibitors and angiotensin converting enzyme inhibitors. The role of computers in drug design is emphasised by classwork and assignments on molecular modelling and structure-activity relationships. The course also extends to a section on the design of diverse pharmacological agents which include compounds for imaging by positron emission tomography (PET), and kinase inhibitors.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

PCOL3912
Drug Design and Development (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Brent McParland **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 3 hour tutorial/practical per week. **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] or a mark of 70 or above in 12 credit points of BCMB2XXX **Prohibitions:** PCOL3012 **Assessment:** One 2 hour exam, in class and online quizzes, assignments (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the lecture and practical components of PCOL3012. Students will be set special advanced assignments related to the material covered in core areas. These may also involve advanced practical work or detailed investigation of a theoretical problem.

Textbooks

Patrick, Graham L. An Introduction to Medicinal Chemistry. 5th edition. Oxford University Press. 2013.

PCOL3021
Drug Therapy

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, three 2 hour tutorials, three 3 hour practicals, elective project (equivalent to four 3 hour practicals) **Prerequisites:** PCOL2011 or (BMED2401 and 12 additional credit points of BMED240X) **Prohibitions:** PCOL3921 **Assessment:** One 2 hour exam, in lecture tests, practical assignment and elective project (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study extends on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of the scientific basis of current and novel approaches to pharmacological treatment for major health challenges of the 21st century. Lecture topics, tutorials and laboratory sessions cover drug treatment of arthritis, cardiovascular disorders, cancer, diabetes and protein misfolding disorders. New approaches to the development of next-generation targeted drugs are also introduced. As part of this course all students will extend the practical skills in understanding scientific literature, statistical analysis, critical problem solving and analytical thinking. Each student will conduct a capstone elective project (laboratory or literature-based) in applied pharmacology supervised by academic members of the department.

Textbooks

Rang and Dale's Pharmacology, 7th edn; Drs. Humphrey P. Rang, Maureen M. Dale, James M. Ritter, Rod Flower, and Graeme Henderson (Churchill Livingstone).

PCOL3921
Drug Therapy (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Slade Matthews **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, three 2 hour tutorials-advanced material, three 3 hour practicals, elective project (equivalent to four 3 hour practicals, preference given for laboratory-based project). **Prerequisites:** A mark of 70 or above in [PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X)] **Prohibitions:** PCOL3021 **Assessment:** One 2 hour exam, two lecture tests, practical assignment and elective project (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will consist of the same lecture series as PCOL3021. The tutorials and practical sessions will extend the work provided in

PCOL321 to challenge deeper learning in the effect of drug therapy on pathophysiology of chronic diseases.

Textbooks

Rang and Dale's Pharmacology, 7th edn; Drs. Humphrey P. Rang, Maureen M. Dale, James M. Ritter, Rod Flower, and Graeme Henderson (Churchill Livingstone).

PCOL3022
Neuropharmacology

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prohibitions:** PCOL3922 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points of BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

PCOL3922
Neuropharmacology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Jonathon Arnold **Session:** Semester 2 **Classes:** Two 1 hour lectures per week, five 1 hour tutorials, three 3 hour practicals, elective project (equivalent to three 4 hour practicals). **Prerequisites:** An annual average mark of 70 or above in the previous year **Prohibitions:** PCOL3022 **Assumed knowledge:** PCOL2011 or (BMED2401 and an additional 12 credit points from BMED240X) **Assessment:** One 2 hour theory exam, tutorial presentation, practical report, lecture quizzes and elective project (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on pharmacological knowledge acquired in the intermediate PCOL and BMED units of study with a major emphasis on gaining an understanding of neuropharmacology. The neuropharmacology of the major neurotransmitters and their role in neuropsychiatric diseases is explored together with the treatment of conditions such as Alzheimer's disease, movement disorders, stroke, depression, anxiety, epilepsy, pain and schizophrenia. Elective projects relate to current research areas in Pharmacology.

Textbooks

Nestler, EJ, Hyman, SE and Malenka, RC. Molecular Neuropharmacology: A Foundations for Clinical Neuroscience, 2nd ed. McGraw Hill, 2009.

Table 1: Physics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Physics			
For a major in Physics, the minimum requirement is 24 credit points from senior units of study listed in this subject area which must include: (i) One Semester 1 Core unit (PHYS3040/3940/3941); and (ii) One Semester 2 Core unit (PHYS3090/3990/3991); and (iii) Two other non-overlapping senior Physics units listed below (chosen from PHYS30XX/39XX).			
Junior units of study			
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics or PHYS1003 or PHYS1004 or PHYS1902 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **N** PHYS1002 or PHYS1901 or EDUH1017 or PHYS1903	Semester 1
PHYS1002 **Physics 1 (Fundamentals)**	6	**A** Students are encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **N** PHYS1001 or PHYS1901 or EDUH1017 or PHYS1903	Semester 1
PHYS1901 **Physics 1A (Advanced)**	6	**A** (85 or above in HSC Physics or equivalent) OR (75 or above in one of PHYS1003 or PHYS1004) OR (PHYS1902 or PHYS1904). Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **N** PHYS1001 or PHYS1002 or EDUH1017 or PHYS1903 *Note: Department permission required for enrolment*	Semester 1
PHYS1903 **Physics 1A (Special Studies Program)**	6	**A** [92 or above in HSC Physics (or equivalent)] OR [80 or above in one of PHYS1904 or PHYS1902]. Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **N** PHYS1001 or PHYS1002 or EDUH1017 or PHYS1901 *Note: Department permission required for enrolment*	Semester 1
PHYS1003 **Physics 1 (Technological)**	6	**A** HSC Physics or PHYS1001 or PHYS1002 or PHYS1901 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **C** Recommended Co-requisites: (MATH1003 or MATH1903) and (MATH1005 or MATH1905). **N** PHYS1004 or PHYS1902 or PHYS1904 *It is recommended that PHYS1001 or PHYS1002 or PHYS1901 be completed before this unit*	Semester 2
PHYS1004 **Physics 1 (Environmental and Life Science)**	6	**A** HSC Physics or PHYS1001 or PHYS1002 or PHYS1901 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **N** PHYS1003 or PHYS1902 or PHYS1904 *It is recommended that PHYS1001 or PHYS1002 or PHYS1901 be completed before this unit*	Semester 2
PHYS1902 **Physics 1B (Advanced)**	6	**A** (85 or above in HSC Physics or equivalent) OR (75 or above in one of PHYS1001 or PHYS1002) OR (PHYS1901 or PHYS1903). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **C** Recommended Co-requisites: (MATH1003 or MATH1903) and (MATH1005 or MATH1905) **N** PHYS1003 or PHYS1004 or PHYS1904 *Note: Department permission required for enrolment*	Semester 2
PHYS1904 **Physics 1B (Special Studies Program)**	6	**A** 75 or above in PHYS1903 or 85 or above in PHYS1901. Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **N** PHYS1003 or PHYS1004 or PHYS1902 *Note: Department permission required for enrolment*	Semester 2
PHYS1500 **Astronomy**	6	*No assumed knowledge of Physics.*	Semester 2
COSC1003 **Introduction to Computational Science**	6	**A** [(MATH1X01 or MATH1X21) and MATH1X02] OR HSC Mathematics, Linear Algebra **N** COSC1903	Semester 2
COSC1903 **Introduction to Computational Sci (Adv)**	6	**A** [(MATH1X01 or MATH1X21) and MATH1X02] OR HSC Mathematics, Linear Algebra **P** 75 or above in (INFO1003 or INFO1903) **N** COSC1003 *Prerequisites: ATAR of at least 90*	Semester 2
Intermediate units of study			
PHYS2011 **Physics 2A**	6	**A** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **P** (PHYS1901 or PHYS1001 or PHYS1002 or PHYS1903) and (PHYS1902 or PHYS1003 or PHYS1004 or PHYS1904) **N** PHYS2911 or PHYS2213	Semester 1
PHYS2911 **Physics 2A (Advanced)**	6	**A** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **P** 65 or above in (PHYS1901 or PHYS1001 or PHYS1002 or PHYS1903) and 65 or above in (PHYS1902 or PHYS1003 or PHYS1004 or PHYS1904) **N** PHYS2011 or PHYS2213	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PHYS2012 **Physics 2B**	6	**A** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **P** (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **N** PHYS2912 or PHYS2213	Semester 2
PHYS2912 **Physics 2B (Advanced)**	6	**A** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **P** 65 or above in (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and 65 or above in (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **N** PHYS2012 or PHYS2213	Semester 2
PHYS2013 **Astrophysics and Relativity**	6	**A** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **P** (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **C** PHYS2012 or PHYS2912 **N** PHYS2913	Semester 2
PHYS2913 **Astrophysics and Relativity (Advanced)**	6	**A** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **P** 65 or above in (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and 65 or above in (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **C** PHYS2912 or PHYS2012 **N** PHYS2013	Semester 2
Senior core units of study			
Students must complete both PHYS3040/3940/3941 and PHYS3090/3990/3991.			
PHYS3040 **Electromagnetism and Physics Lab**	6	**P** PHYS2X11 and PHYS2X12 and (MATH2X21 or MATH2X61 or MATH2067) **N** PHYS3940 or PHYS3941	Semester 1
PHYS3940 **Electromagnetism and Physics Lab (Adv)**	6	**P** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (MATH2X21 or MATH2X61 or MATH2067) **N** PHYS3040 or PHYS3941	Semester 1
PHYS3941 **Electromagnetism and Special Project (Adv)**	6	**P** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (MATH2X21 or MATH2X61 or MATH2067) **N** PHYS3040 or PHYS3940 or PHYS3961 or PHYS3011 or PHYS3911 or PHYS3918 or PHYS3928 *Note: Department permission required for enrolment* *Approval for this unit must be obtained from the School of Physics Senior Coordinator.*	Semester 1
PHYS3090 **Statistical Mechanics and Physics Lab**	6	**P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) **N** PHYS3990 or PHYS3991	Semester 2
PHYS3990 **Statistical Mechanics and Phys. Lab (Adv)**	6	**P** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) **N** PHYS3090 or PHYS3991	Semester 2
PHYS3991 **Statistical Mechanics and Project (Adv)**	6	**P** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) **N** PHYS3090 or PHYS3990 *Note: Department permission required for enrolment*	Semester 2
Senior elective units of study			
PHYS3015 **Topics in Senior Physics A**	6	**A** 6 credit points of Intermediate Mathematics **P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) *Note: Department permission required for enrolment*	Semester 1
PHYS3915 **Topics in Senior Physics A (Advanced)**	6	**A** 6 credit points of Intermediate Mathematics **P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) with average of at least 70 *Note: Department permission required for enrolment*	Semester 1
PHYS3025 **Topics in Senior Physics B**	6	**A** 6 credit points of Intermediate Mathematics **P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) *Note: Department permission required for enrolment*	Semester 2
PHYS3925 **Topics in Senior Physics B (Advanced)**	6	**P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) with average of at least 70 *Note: Department permission required for enrolment*	Semester 2
PHYS3039 **Quantum Physics/Comp. Physics and Lab**	6	**P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) **N** PHYS3939 or PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944 or PHYS3060 or PHYS3960 or PHYS3961 or PHYS3062 or PHYS3962 or COSC3011 or COSC3911	Semester 1
PHYS3939 **Quantum Physics/Comp. Phys. and Lab (Adv)**	6	**P** A mark of 70 or above in both PHYS2X11 and PHYS2X12 **N** PHYS3039 or PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944 or PHYS3060 or PHYS3960 or PHYS3961 or PHYS3062 or PHYS3962 or COSC3011 or COSC3911	Semester 1
PHYS3042 **Quantum Physics/Astrophysics/Plasma**	6	**P** PHYS2X11 and PHYS2X12 and (MATH2X21 or MATH2X61 or MATH2067) **C** PHYS3040 or PHYS3940 or PHYS3941 **N** Any of the following- (PHYS3039, PHYS3939, PHYS3942, PHYS3043, PHYS3943, PHYS3044, PHYS3944, PHYS3047, PHYS3947, PHYS3048, PHYS3948, PHYS3054, PHYS3954, PHYS3055, PHYS3955, PHYS3059, PHYS3959, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982)	Semester 1
PHYS3942 **Quantum Physics/Astrophysics/Plasma(Adv)**	6	**P** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (MATH2X21 or MATH2X61 or MATH2067) **C** PHYS3040 or PHYS3940 or PHYS3941 **N** Any one of the following (PHYS3039, PHYS3939, PHYS3042, PHYS3043, PHYS3943, PHYS3044, PHYS3944, PHYS3047, PHYS3947, PHYS3048, PHYS3948, PHYS3054, PHYS3954, PHYS3055, PHYS3955, PHYS3059, PHYS3959, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982)	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PHYS3043 **Quantum Physics/Astrop/Comp. Physics**	6	**P** PHYS2X11 and PHYS2X12 and (MATH2X21 or MATH2X61 or MATH2067) **N** Any one of the following- (PHYS3039, PHYS3939, PHYS3942, PHYS3042, PHYS3943, PHYS3044, PHYS3944, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982, COSC3011, COSC3911)	Semester 1
PHYS3943 **Quantum Physics/Astrop/Comp. Phys. (Adv)**	6	**P** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (MATH2X21 or MATH2X61 or MATH2067) **N** Any one of the following (PHYS3039, PHYS3939, PHYS3042, PHYS3942, PHYS3043, PHYS3044, PHYS3944, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982, COSC3011, COSC3911)	Semester 1
PHYS3044 **Quantum Physics/Plasma/Comp. Physics**	6	**P** PHYS2X11 and PHYS2X12 and (MATH2X21 or MATH2X61 or MATH2067) **C** PHYS3040 or PHYS3940 or PHYS3941 **N** Any of the following- (PHYS3039, PHYS3939, PHYS3042, PHYS3942, PHYS3043, PHYS3943, PHYS3944, PHYS3047, PHYS3947, PHYS3048, PHYS3948, PHYS3054, PHYS3954, PHYS3055, PHYS3955, PHYS3059, PHYS3959, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3073, PHYS3973, COSC3011, COSC3911)	Semester 1
PHYS3944 **Quantum Physics/Plasma/Comp. Phys. (Adv)**	6	**P** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (MATH2X21 or MATH2X61 or MATH2067) **C** PHYS3040 or PHYS3940 or PHYS3941 **N** Any one of the following (PHYS3039, PHYS3939, PHYS3042, PHYS3942, PHYS3043, PHYS3943, PHYS3044, PHYS3047, PHYS3947, PHYS3048, PHYS3948, PHYS3054, PHYS3954, PHYS3055, PHYS3955, PHYS3059, PHYS3959, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3073, PHYS3973, COSC3011, COSC3911)	Semester 1
PHYS3068 **Condensed Matter Phys/Optics and Lab**	6	**P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944) and (PHYS3040 or PHYS3940 or PHYS3941) **C** PHYS3090 or PHYS3990 or PHYS3991 **N** Any one of the following- (PHYS3968, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3062, PHYS3962, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3074, PHYS3974, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3067, PHYS3967)	Semester 2
PHYS3968 **Condensed Matter Phys/Optics and Lab (Adv)**	6	**P** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (PHYS3X42 or PHYS3X43 or PHYS3X44), and (PHYS3X40 or PHYS3941) **C** PHYS3090 or PHYS3990 or PHYS3991 **N** Any one of the following (PHYS3068, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3062, PHYS3962, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3074, PHYS3974, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3067, PHYS3967)	Semester 2
PHYS3069 **High Energy Physics/Optics and Lab**	6	**P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS2013 or PHYS2913) and (PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944) and (PHYS3040 or PHYS3940 or PHYS3941) **N** Any one of the following: (PHYS3969, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3068, PHYS3968, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3074, PHYS3974, PHYS3076, PHYS3976, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3065, PHYS3965, PHYS3066, PHYS3966)	Semester 2
PHYS3969 **High Energy Physics/Optics and Lab (Adv)**	6	**P** (A mark of 70 or above in PHYS2X11 and PHYS2X12 and PHYS2X13) and (PHYS3X42 or PHYS3X43 or PHYS3X44), and (PHYS3X40 or PHYS3941) **N** Any one of the following (PHYS3069, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3068, PHYS3968, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3074, PHYS3974, PHYS3076, PHYS3976, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3065, PHYS3965, PHYS3066, PHYS3966)	Semester 2
PHYS3074 **Condensed Matter/High Energy and Lab**	6	**P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS2013 or PHYS2913) and (PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944) **C** PHYS3090 or PHYS3990 or PHYS3991 **N** Any one of the following (PHYS3974, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3067, PHYS3967)	Semester 2
PHYS3974 **Condensed Matter/High Energy and Lab (Adv)**	6	**P** (A mark of 70 or above in PHYS2X11 and PHYS2X12 and PHYS2X13) and (PHYS3X42 or PHYS3X43 or PHYS3X44) **C** PHYS3090 or PHYS3990 or PHYS3991 **N** Any one of the following (PHYS3074, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3067, PHYS3967)	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PHYS3080 **Condensed Matter/High Energy/Optics**	6	**P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS2013 or PHYS2913) and (PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944) and (PHYS3040 or PHYS3940 or PHYS3941) **C** PHYS3090 or PHYS3990 or PHYS3991 **N** Any one of the following (PHYS3980, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3074, PHYS3974, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3067, PHYS3967)	Semester 2
PHYS3980 **Condensed Matter/High Energy/Optics(Adv)**	6	**P** (A mark of 70 or above in PHYS2X11 and PHYS2X12 and PHYS2X13) and (PHYS3X42 or PHYS3X43 or PHYS3X44) and (PHYS3X40 or PHYS3941) **C** PHYS3090 or PHYS3990 or PHYS3991 **N** Any one of the following (PHYS3080, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3074, PHYS3974, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3067, PHYS3967)	Semester 2
PHYS3099 **Stat. Mechanics/Cond. Matter and Lab**	6	**P** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS3039 or PHYS3939) **N** Any one of the following (PHYS3090, PHYS3990, PHYS3999, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3074, PHYS3974, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981)	Semester 2
PHYS3999 **Stat. Mechanics/Cond. Matter and Lab (Adv)**	6	**P** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and PHYS3X39 **N** PHYS3090 or PHYS3990 or PHYS3099 or PHYS3062 or PHYS3962 or PHYS3068 or PHYS3968 or PHYS3074 or PHYS3974 or PHYS3079 or PHYS3979 or PHYS3080 or PHYS3980 or PHYS3081 or PHYS3981	Semester 2

Physics

For a major in Physics, the minimum requirement is 24 credit points from senior units of study listed in this subject area which must include:(i) One Semester 1 Core unit (PHYS3040/3940/3941); and(ii) One Semester 2 Core unit (PHYS3090/3990/3991); and(iii) Two other non-overlapping senior Physics units listed below (chosen from PHYS30XX/39XX).

Junior units of study

PHYS1001
Physics 1 (Regular)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 1 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 9 weeks and one 1-hour tutorial per week. **Prohibitions:** PHYS1002 or PHYS1901 or EDUH1017 or PHYS1903 **Assumed knowledge:** HSC Physics or PHYS1003 or PHYS1004 or PHYS1902 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **Assessment:** 3 hour exam plus laboratories, assignments and mid-semester tests (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is for students who gained 65 marks or better in HSC Physics or equivalent. The lecture series contains three modules on the topics of mechanics, thermal physics, and oscillations and waves.

Textbooks

Young and Freedman. University Physics with Modern Physics, Global Edition. 14th edition, Pearsons 2015. Course lab manual.

PHYS1002
Physics 1 (Fundamentals)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 1 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 9 weeks and one 1-hour tutorial per week. **Prohibitions:** PHYS1001 or PHYS1901 or EDUH1017 or PHYS1903 **Assumed knowledge:** Students are encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **Assessment:** 3 hour exam plus laboratories, assignments and mid-semester tests (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed for students who have not studied Physics previously or scored below 65 in HSC Physics. The lecture series contains modules on the language of physics, mechanics, and oscillations and waves.

Textbooks

College Physics: A Strategic Approach by Knight, Jones and Field, 3rd edition. Pearsons 2014. Course lab manual.

PHYS1901
Physics 1A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 1 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 9 weeks and one 1-hour tutorial per week. **Prohibitions:** PHYS1001 or PHYS1002 or EDUH1017 or PHYS1903 **Assumed knowledge:** (85 or above in HSC Physics or equivalent) OR (75 or above in one of PHYS1003 or PHYS1004) OR (PHYS1902 or PHYS1904). Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **Assessment:** 3-hour exam plus laboratories, assignments and mid-semester tests (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit of study is intended for students who have a strong background in Physics and an interest in studying more advanced topics. It proceeds faster than Physics 1 (Regular), covering further and more difficult material. The lecture series contains modules on the topics of mechanics, thermal physics, oscillations and waves and chaos. The laboratory work also provides an introduction to computational physics using chaos theory as the topic of study.

Textbooks

Young and Freedman. University Physics with Modern Physics, Global Edition. 14th edition, Pearsons 2015. Course lab manual.

PHYS1903
Physics 1A (Special Studies Program)

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1hr lectures per week, 1x1hr tutorial per week **Prohibitions:** PHYS1001 or PHYS1002 or EDUH1017 or PHYS1901 **Assumed knowledge:** [92 or above in HSC Physics (or equivalent)] OR [80 or above in one of PHYS1904 or PHYS1902]. Students are also encouraged to take (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and MATH1X02 concurrently. **Assessment:** 3hr exam plus laboratories, assignments, mid-semester tests and end-of-semester lab project presentation **Practical field work:** 1x3hr laboratory for 9 weeks, including short project-based exercises **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The unit is intended for high achieving students who have a strong background in Physics and an interest in studying more advanced topics. It shares lecture and tutorial classes with PHYS1901, with modules on the topics of mechanics, thermal physics oscillations and wave and chaos. However, it features a laboratory component that is very different, with project-based exercises and a more open-ended research format than other lab classes.

Textbooks

Young and Freedman, University Physics, 14th edition with Modern Physics, Global Edition, Pearson 2015. Course lab manual

PHYS1003
Physics 1 (Technological)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 2 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 10 weeks, one 1-hour tutorial per week. **Corequisites:** Recommended Co-requisites: (MATH1003 or MATH1903) and (MATH1005 or MATH1905). **Prohibitions:** PHYS1004 or PHYS1902 or PHYS1904 **Assumed knowledge:** HSC Physics or PHYS1001 or PHYS1002 or PHYS1901 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **Assessment:** 3 hour exam plus laboratories, tutorials, and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: It is recommended that PHYS1001 or PHYS1002 or PHYS1901 be completed before this unit

This unit of study is designed for students majoring in physical and engineering sciences and emphasis is placed on applications of physical principles to the technological world. The lecture series contains modules on the topics of fluids, electromagnetism, and quantum physics.

Textbooks

Young and Freedman. University Physics with Modern Physics, Global Edition. 14th edition, Pearsons 2015. Course lab manual.

PHYS1004
Physics 1 (Environmental and Life Science)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 2 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 10 weeks and one 1-hour tutorial per week. **Prohibitions:** PHYS1003 or PHYS1902 or PHYS1904 **Assumed knowledge:** HSC Physics or PHYS1001 or PHYS1002 or PHYS1901 or equivalent. Students who have not completed HSC Physics (or equivalent) are strongly advised to take the Physics Bridging Course (offered in February). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **Assessment:** 3-hour exam plus laboratories and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: It is recommended that PHYS1001 or PHYS1002 or PHYS1901 be completed before this unit

This unit of study has been designed specifically for students interested in further study in environmental and life sciences. The lecture series contains modules on the topics of properties of matter, electromagnetism, and radiation and its interactions with matter.

Textbooks

College Physics: A Strategic Approach by Knight, Jones and Field, 3rd edition. Pearsons 2014. Course lab manual.

PHYS1902
Physics 1B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 2 **Classes:** Three 1-hour lectures, one 3-hour laboratory per week for 10 weeks and one 1-hour tutorial per week. **Corequisites:** Recommended Co-requisites: (MATH1003 or MATH1903) and (MATH1005 or MATH1905) **Prohibitions:** PHYS1003 or PHYS1004 or PHYS1904 **Assumed knowledge:** (85 or above in HSC Physics or equivalent) OR (75 or above in one of PHYS1001 or PHYS1002) OR (PHYS1901 or PHYS1903). Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **Assessment:** 3-hour exam plus laboratories, and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit of study is a continuation of the more advanced treatment of Physics 1A (Advanced). Students who have completed PHYS1001 or PHYS1002 at Distinction level may enrol. It proceeds faster than Physics 1 (Technological), covering further and more difficult material. The lecture series contains modules on the topics of fluids, electricity and magnetism, and quantum physics.

Textbooks

Young and Freedman. University Physics with Modern Physics, Global Edition. 14th edition, Pearsons 2015. Course lab manual.

PHYS1904
Physics 1B (Special Studies Program)

Credit points: 6 **Session:** Semester 2 **Classes:** 3x1hr lectures per week, 1x1hr tutorial per week **Prohibitions:** PHYS1003 or PHYS1004 or PHYS1902 **Assumed knowledge:** 75 or above in PHYS1903 or 85 or above in PHYS1901. Entry is by invitation. This unit of study is deemed to be an Advanced unit of study. Students are also encouraged to take (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and MATH1X05 concurrently. **Assessment:** 3hr exam plus laboratories, assignments, mid-semester tests and end-of-semester research project report and presentation **Practical field work:** 1x3hr laboratory for 4 weeks and a research project in the other weeks of semester **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The unit is a continuation for high achieving students of PHYS1904. It shares lecture and tutorial classes with PHYS1902, with modules on the topics of fluids, electricity and magnetism, and quantum physics. The lab component features a research project to be performed with researchers in one of the School's research groups.

Textbooks

Young and Freedman, University Physics, 14th edition with Modern Physics, Global Edition, Pearson 2015. Course lab manual

PHYS1500
Astronomy

Credit points: 6 **Teacher/Coordinator:** Dr Helen Johnston **Session:** Semester 2 **Classes:** Three 1-hour lectures, one 2-hour laboratory and one 1-hour tutorial per week. **Assessment:** 2 hour exam plus laboratories, assignments and night-viewing project (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: No assumed knowledge of Physics.

This unit of study provides a broad understanding of the structure, scale and diversity of the universe and an appreciation of the scientific methods used to achieve this understanding. Current areas of investigation, new ideas and concepts which often receive wide media attention will be used to demonstrate how science attempts to understand new and remote phenomena and how our ideas of our place in the universe are changing. The range of topics includes the planets, the solar system and its origin, spacecraft discoveries, stars, supernova, black holes, galaxies, quasars, cosmology and the Big Bang. It also includes day and night sky observing sessions. This unit of study cannot be counted as part of the 12 credit points of Junior Physics necessary for enrolment in Intermediate Physics.

Textbooks

Bennett, et al. The Cosmic Perspective. 7th edition, with Mastering Astronomy. Pearsons, 2014. Course lab manual.

COSC1003
Introduction to Computational Science

Credit points: 6 **Teacher/Coordinator:** Dr Tristram Aexander **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours of practicals per week. **Prohibitions:** COSC1903 **Assumed knowledge:** [(MATH1X01 or MATH1X21) and MATH1X02] OR HSC Mathematics, Linear Algebra **Assessment:** One 2-hour final exam, one assignment, two lab-based practical tests and completion of computational lab sessions (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study focuses on scientific problem solving and data visualization using computers. Students will learn how to solve problems arising in the natural sciences and mathematics using core features of MATLAB, with a choice of problems from various areas of science. No previous knowledge of programming is assumed.

COSC1903
Introduction to Computational Sci (Adv)

Credit points: 6 **Teacher/Coordinator:** Dr Tristram Alexander **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours of practicals per week. **Prerequisites:** 75 or above in (INFO1003 or INFO1903) **Prohibitions:** COSC1003 **Assumed knowledge:** [(MATH1X01 or MATH1X21) and

MATH1X02] OR HSC Mathematics, Linear Algebra **Assessment:** One 2-hour final exam, one assignment, two lab-based practical tests and completion of computational lab sessions (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Prerequisites: ATAR of at least 90

This unit of study focuses on scientific problem solving and data visualization using computers. Students will learn how to solve problems arising in the natural sciences and mathematics using core features of MATLAB, with a choice of problems from various areas of science. No previous knowledge of programming is assumed.

Intermediate units of study

PHYS2011
Physics 2A

Credit points: 6 **Teacher/Coordinator:** Prof Iver Cairns **Session:** Semester 1 **Classes:** Two 1-hour lectures per week for 11 weeks; one 2-hour computational laboratory and one 3-hour experimental laboratory per week for 10 weeks. **Prerequisites:** (PHYS1901 or PHYS1001 or PHYS1002 or PHYS1903) and (PHYS1902 or PHYS1003 or PHYS1004 or PHYS1904) **Prohibitions:** PHYS2911 or PHYS2213 **Assumed knowledge:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **Assessment:** One 2-hour exam, assignments, one 1-hour computational test, practical work, practical report and presentation, computational lab work (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

In combination with two semesters of Junior Physics, this unit of study continues a first pass through the major branches of classical and modern physics, providing students with a sound basis for later Physics units or for studies in other areas of science or technology. Hence, this unit suits students continuing with the study of Physics at the Intermediate level, and those wishing to round out their knowledge of physics before continuing in other fields. The modules in this unit of study are: Optics: The wave nature of light, and its interactions with matter; applications including spectroscopy and fibre optics. Thermodynamics: The thermal properties of matter. Computational Physics: In a PC-based computing laboratory students use simulation software to conduct virtual experiments in physics, which illustrate and extend the relevant lectures. Students also gain general skills in the use of computers to solve problems in physics. An introductory session of MATLAB is held in the first three lab sessions for students who are not familiar with programming. Practical: Experimental Physics is taught as a laboratory module and includes experiments in the areas of electrical circuits, nuclear decay and particles, properties of matter, and other topics. Assessment is based on mastery of each attempted experiment. At the end of the semester students prepare a short report on one experiment and make an oral presentation on it.

Textbooks

Young and Freedman, University Physics with Modern Physics Technology Update, 13th edition. with Mastering Physics, Pearsons, 2014.

PHYS2911
Physics 2A (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Iver Cairns **Session:** Semester 1 **Classes:** Two 1-hour lectures per week for 11 weeks; one 2-hour computational laboratory and one 3-hour experimental laboratory per week for 10 weeks. **Prerequisites:** 65 or above in (PHYS1901 or PHYS1001 or PHYS1002 or PHYS1903) and 65 or above in (PHYS1902 or PHYS1003 or PHYS1004 or PHYS1904) **Prohibitions:** PHYS2011 or PHYS2213 **Assumed knowledge:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **Assessment:** One 2-hour exam, assignments, one 1-hour computational test, practical work, practical report and presentation, computational lab work (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed for students with a strong interest in Physics. The lecture topics are as for PHYS2011. They are treated in greater depth and with more rigorous attention to derivations than in PHYS2011. The assessment reflects the more challenging nature of the material presented.

Textbooks

Young and Freedman, University Physics with Modern Physics Technology Update, 13th edition. with Mastering Physics, Pearsons, 2014.

PHYS2012
Physics 2B

Credit points: 6 **Teacher/Coordinator:** Prof Iver Cairns **Session:** Semester 2 **Classes:** Three 1-hour lectures per week; one 2-hour computational laboratory per week for 11 weeks. **Prerequisites:** (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **Prohibitions:** PHYS2912 or PHYS2213 **Assumed knowledge:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **Assessment:** One 3-hour exam, assignments, one 1-hour computational test, computational lab work and project, practical work and report (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed for students continuing with the study of Physics at the general Intermediate level, and represents the beginning of a more in-depth study of the main topics of classical and modern physics. The modules in this unit of study are: Quantum Physics: The behaviour of matter and radiation at the microscopic level. Electromagnetic Properties of Matter: Electric and magnetic effects in materials; the combination of electric and magnetic fields to produce light and other electromagnetic waves; the effects of matter on electromagnetic waves. Computational Physics: The computational physics component is similar to that of PHYS2011.

Textbooks

Serway, Moses and Moyer. Modern Physics. 3rd edition. Brooks/Cole. 2005.

PHYS2912
Physics 2B (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Iver Cairns **Session:** Semester 2 **Classes:** Three 1-hour lectures per week, one-2 hour computational laboratory per week for 11 weeks. **Prerequisites:** 65 or above in (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and 65 or above in (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **Prohibitions:** PHYS2012 or PHYS2213 **Assumed knowledge:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **Assessment:** One 3-hour exam, assignments, one 1-hour computational test, computational lab work and project, practical work and report (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Refer to PHYS2911 for an overall description of the Advanced Intermediate Physics program. The lecture topics are as for PHYS2012 with some advanced content. Computational Physics: As for PHYS2012, but at a more advanced level.

Textbooks

Young and Freedman, University Physics with Modern Physics Technology Update, 13th edition. with Mastering Physics, Pearsons, 2014.

PHYS2013
Astrophysics and Relativity

Credit points: 6 **Teacher/Coordinator:** Prof Iver Cairns **Session:** Semester 2 **Classes:** Two 1-hour lectures per week for 11 weeks and one 3-hour experimental laboratory per week for 12 weeks. **Prerequisites:** (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **Corequisites:** PHYS2012 or PHYS2912 **Prohibitions:** PHYS2913 **Assumed knowledge:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **Assessment:** One 2-hour exam, assignments, practical work, practical report and oral presentation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study builds on the foundation provided by Junior Physics and first semester of Intermediate Physics, to provide introductions to Cosmology (Structure and evolution of the Universe), and Special Relativity (Space and time at high velocities). Practical: Experimental Physics is taught as a laboratory module and includes experiments in the areas of analysis of stellar images, electromagnetic phenomena, electronic instrumentation, quantum physics, and other topics. Assessment is based on mastery of each attempted experiment. At the end of the semester students may work in teams on a project. Students prepare a written report and oral presentation on their project or one experiment.

Textbooks

Young and Freedman, University Physics with Modern Physics Technology Update, 13th edition. with Mastering Physics, Pearsons, 2014.

PHYS2913
Astrophysics and Relativity (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Iver Cairns **Session:** Semester 2 **Classes:** Two 1-hour lectures per week for 11 weeks; one 3-hour experimental laboratory per week for 12 weeks. **Prerequisites:** 65 or above in (PHYS1003 or PHYS1004 or PHYS1902 or PHYS1904) and 65 or above in (PHYS1001 or PHYS1002 or PHYS1901 or PHYS1903 or PHYS2011 or PHYS2911) **Corequisites:** PHYS2912 or PHYS2012 **Prohibitions:** PHYS2013 **Assumed knowledge:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906) and (MATH1X02) and (MATH1X23 or MATH1933 or MATH1X03 or MATH1907) and (MATH1X05) **Assessment:** One 3-hour exam, assignments, practical work, practical report and oral presentation (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lecture topics are as PHYS2013 with some advanced content. Practical: as for PHYS2013.

Textbooks

Young and Freedman, University Physics with Modern Physics Technology Update, 13th edition. with Mastering Physics, Pearsons, 2014.

Senior core units of study

Students must complete both PHYS3040/3940/3941 and PHYS3090/3990/3991.

PHYS3040
Electromagnetism and Physics Lab

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Nineteen 1-hour lectures and twelve 4-hour practicals. **Prerequisites:** PHYS2X11 and PHYS2X12 and (MATH2X21 or MATH2X61 or MATH2067) **Prohibitions:** PHYS3940 or PHYS3941 **Assessment:** One 1.5 hour exam, quizzes, practical reports and oral presentation (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures cover the theory of electromagnetism, one of the cornerstones of classical physics. They introduce Maxwell's equations in their differential form, using the power of vector calculus. The main application will be to electromagnetic waves, including reflection and absorption, which have application in fields such as optics, plasma physics and astrophysics. In the practical laboratory classes, students will choose from a range of experiments that aim to give them an appreciation of the analytical, technical and practical skills required to conduct modern experimental work.

Textbooks

Griffiths, DJ. Introduction to Electrodynamics. Third Edition.

PHYS3940
Electromagnetism and Physics Lab (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Nineteen 1-hour lectures and twelve 4-hour practicals. **Prerequisites:** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (MATH2X21 or MATH2X61 or MATH2067) **Prohibitions:** PHYS3040 or PHYS3941 **Assessment:** One 1.5 hour exam, quizzes, assignments, practical reports and oral presentation (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3040, but with greater depth and some more challenging material.

Textbooks

Griffiths, DJ. Introduction to Electrodynamics. Third Edition.

PHYS3941
Electromagnetism and Special Project (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Nineteen 1-hour lectures, 4 hours per week with a research group. **Prerequisites:** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (MATH2X21 or MATH2X61 or MATH2067) **Prohibitions:** PHYS3040 or PHYS3940 or PHYS3961 or PHYS3011 or PHYS3911 or PHYS3918 or PHYS3928 **Assessment:** One 1.5 hour exam, quizzes, assignments, project report and talk (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Approval for this unit must be obtained from the School of Physics Senior Coordinator.

The lectures cover the theory of electromagnetism, one of the cornerstones of classical physics. They introduce Maxwell's equations in their differential form, using the power of vector calculus. The main application will be to electromagnetic waves, including reflection and absorption, which have application in fields such as optics, plasma physics and astrophysics. The project is carried out in a research group within the School of Physics, working on a research experiment or theoretical project supervised by a researcher. The aim is for students to acquire an understanding of the nature of research, to apply their knowledge of physics and scientific practice, and to serve as preparation for a research project at Honours level and beyond.

Textbooks

Griffiths, DJ. Introduction to Electrodynamics. Third Edition.

PHYS3090
Statistical Mechanics and Physics Lab

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Nineteen 1-hour lectures and twelve 4-hour experimental labs **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) **Prohibitions:** PHYS3990 or PHYS3991 **Assessment:** One 1.5 hour exam, assignments, laboratory reports and presentation. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Statistical Mechanics aim to provide a theoretical foundation for statistical mechanics, including both classical and quantum distributions.

In the Laboratory Classes, students will choose from a range of experiments that aim to give them an appreciation of the analytical, technical and practical skills required to conduct modern experimental work.

Textbooks

An Introduction to Thermal Physics, Daniel V. Schroeder.

PHYS3990
Statistical Mechanics and Phys. Lab (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Nineteen 1-hour lectures and twelve 4-hour experimental labs. **Prerequisites:** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) **Prohibitions:** PHYS3090 or PHYS3991 **Assessment:** One 1.5-hour exam, assignments, laboratory reports and presentation (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3090, but with greater depth and some more challenging material.

Textbooks

An Introduction to Thermal Physics, David V. Schroeder

PHYS3991
Statistical Mechanics and Project (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Nineteen 1-hour lectures and 4 hours/week with a research group. **Prerequisites:** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) **Prohibitions:** PHYS3090 or PHYS3990 **Assessment:** One 1.5-hour exam, assignments, project report and presentation (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The lectures on Statistical Mechanics aim to provide a theoretical foundation for statistical mechanics, including both classical and quantum distributions.

In the Project, students will spend about 4 hours per week working on a research experiment or theoretical project supervised by a researcher. The aim is for students to acquire an understanding of the nature of research by carrying out a project under the supervision of a researcher, and as part of a research group.

Textbooks

An Introduction to Thermal Physics, David V. Schroeder.

Senior elective units of study

PHYS3015
Topics in Senior Physics A

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** 40 hours per semester. **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) **Assumed knowledge:** 6 credit points of Intermediate Mathematics **Assessment:** Exams and/or assignments and/or practical reports. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is normally restricted to students not majoring in Physics, giving them the flexibility to take a combination of modules that is not offered in the standard units. Please obtain permission from the Senior Physics Coordinator.

PHYS3915
Topics in Senior Physics A (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** 40 hours per semester **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) with average of at least 70 **Assumed knowledge:** 6 credit points of Intermediate Mathematics **Assessment:** Exams and/or assignments and/or laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit of study covers the same topics as PHYS3015, with some more challenging material.

PHYS3025
Topics in Senior Physics B

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** 40 hours per semester. **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) **Assumed knowledge:** 6 credit points of Intermediate Mathematics **Assessment:** Exams and/or assignments and/or practical reports. **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit is normally restricted to students not majoring in Physics, giving them the flexibility to take a combination of modules that is not offered in the standard units. Please obtain permission from the Senior Physics Coordinator.

PHYS3925
Topics in Senior Physics B (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** 40 hours per semester **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) with average of at least 70 **Assessment:** Exams and/or assignments and/or laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit of study covers the same topics as PHYS3025, with some more challenging material.

PHYS3039
Quantum Physics/Comp. Physics and Lab

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Twenty seven 1-hour lectures, eight 2-hour computer labs and six 4-hour experimental labs. **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) **Prohibitions:** PHYS3939 or PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944 or PHYS3060 or PHYS3960 or PHYS3961 or PHYS3062 or PHYS3962 or COSC3011 or COSC3911 **Assessment:** One 2-hour exam, assignments and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Quantum Physics build on Intermediate Quantum Physics to cover more advanced topics, including atomic theory and spectroscopy, quantisation of the hydrogen atom, angular momentum in quantum mechanics, and perturbation theory.

The module on Computational Physics uses a mixture of lectures and computational lab sessions to explore problem solving using computers. It covers numerical schemes for solving ordinary and partial differential equations, with emphasis on choosing the best method to suit the problem, and on understanding numerical accuracy and stability. All coding is done in MATLAB, and no programming experience is assumed beyond that covered in Intermediate Physics.

In the Laboratory Classes, students will choose from a range of experiments that aim to give them an appreciation of the analytical, technical and practical skills required to conduct modern experimental work.

PHYS3939
Quantum Physics/Comp. Phys. and Lab (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Twenty seven 1-hour lectures, eight 2-hour computer labs and six 4-hour experimental labs. **Prerequisites:** A mark of 70 or above in both PHYS2X11 and PHYS2X12 **Prohibitions:** PHYS3039 or PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944 or PHYS3060 or PHYS3960 or PHYS3961 or PHYS3062 or PHYS3962 or COSC3011 or COSC3911 **Assessment:** One 2-hour exam, quizzes, assignments and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3039, but with greater depth and some more challenging material.

PHYS3042
Quantum Physics/Astrophysics/Plasma

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Fifty seven 1-hour lectures. **Prerequisites:** PHYS2X11 and PHYS2X12 and (MATH2X21 or MATH2X61 or MATH2067) **Corequisites:** PHYS3040 or PHYS3940 or PHYS3941 **Prohibitions:** Any of the following- (PHYS3039, PHYS3939, PHYS3942, PHYS3043, PHYS3943, PHYS3044, PHYS3944, PHYS3047, PHYS3947, PHYS3048, PHYS3948, PHYS3054, PHYS3954, PHYS3055, PHYS3955, PHYS3059, PHYS3959, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982) **Assessment:** One 3-hour exam, quizzes and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Quantum Physics build on Intermediate Quantum Physics to cover more advanced topics, including atomic theory and spectroscopy, quantisation of the hydrogen atom, angular momentum in quantum mechanics, and perturbation theory.

The lectures on Astrophysics cover the structure and evolution of stars. We will describe the processes that take place as stars evolve, and the eventual fates of different types of stars. We will show that the presence of a binary companion can greatly alter the fate of a star, and show how accretion can liberate large amounts of energy.

The lectures on Plasma Physics aim to provide an understanding of the physics of fundamental phenomena in plasmas and to introduce the basic methods of theoretical and experimental plasma physics. The course includes a study of collective phenomena and sheaths, collisional processes, single particle motions, fluid models, equilibria, waves, electromagnetic properties, instabilities, and introduction to kinetic theory. Examples will be given, where appropriate, of the application of these concepts to naturally occurring and man-made plasmas.

Textbooks

Quantum Mechanics: A Paradigms Approach, D.H. McIntyre, C.A. Minogue, and J. Tate

PHYS3942
Quantum Physics/Astrophysics/Plasma(Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Fifty seven 1-hour lectures. **Prerequisites:** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (MATH2X21 or MATH2X61 or MATH2067) **Corequisites:** PHYS3040 or PHYS3940 or PHYS3941 **Prohibitions:** Any one of the following (PHYS3039, PHYS3939, PHYS3042, PHYS3043, PHYS3943, PHYS3044, PHYS3944, PHYS3047, PHYS3947, PHYS3048, PHYS3948, PHYS3054, PHYS3954, PHYS3055, PHYS3955, PHYS3059, PHYS3959, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982) **Assessment:** One 3-hour exam, quizzes, and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3042, but with greater depth and some more challenging material.

Textbooks

A Modern Approach to Quantum Mechanics, J. Townsend

PHYS3043
Quantum Physics/Astrop/Comp. Physics

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Forty six 1-hour lectures and eight 2-hour computer labs. **Prerequisites:** PHYS2X11 and PHYS2X12 and (MATH2X21 or MATH2X61 or MATH2067) **Prohibitions:** Any one of the following- (PHYS3039, PHYS3939, PHYS3942, PHYS3042, PHYS3943, PHYS3044, PHYS3944, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982, COSC3011, COSC3911) **Assessment:** One 3-hour exam, quizzes and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Quantum Physics build on Intermediate Quantum Physics to cover more advanced topics, including atomic theory and spectroscopy, quantisation of the hydrogen atom, angular momentum in quantum mechanics, and perturbation theory.

The lectures on Astrophysics cover the structure and evolution of stars. We will describe the processes that take place as stars evolve, and the eventual fates of different types of stars. We will show that the presence of a binary companion can greatly alter the fate of a star, and show how accretion can liberate large amounts of energy.

The module on Computational Physics uses a mixture of lectures and computational lab sessions to explore problem solving using computers. It covers numerical schemes for solving ordinary and partial differential equations, with emphasis on choosing the best method to suit the problem, and on understanding numerical accuracy and stability. All coding is done in MATLAB, and no programming experience is assumed beyond that covered in Intermediate Physics.

Textbooks

Quantum Mechanics: A Paradigms Approach, D.H. McIntyre, C.A. Minogue, and J. Tate

PHYS3943
Quantum Physics/Astrop/Comp. Phys. (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Forty six 1-hour lectures and eight 2-hour computer labs. **Prerequisites:** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (MATH2X21 or MATH2X61 or MATH2067) **Prohibitions:** Any one of the following (PHYS3039, PHYS3939, PHYS3042, PHYS3942, PHYS3043, PHYS3044, PHYS3944, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982, COSC3011, COSC3911) **Assessment:** One 3-hour exam, quizzes and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3043, but with greater depth and some more challenging material.

Textbooks

A Modern Approach to Quantum Mechanics, J. Townsend

PHYS3044
Quantum Physics/Plasma/Comp. Physics

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Forty six 1-hour lectures and eight 2-hour computer labs. **Prerequisites:** PHYS2X11 and PHYS2X12 and (MATH2X21 or MATH2X61 or MATH2067) **Corequisites:** PHYS3040 or PHYS3940 or PHYS3941 **Prohibitions:** Any of the following- (PHYS3039, PHYS3939, PHYS3042, PHYS3942, PHYS3043, PHYS3943, PHYS3944, PHYS3047, PHYS3947, PHYS3048, PHYS3948, PHYS3054, PHYS3954, PHYS3055, PHYS3955, PHYS3059, PHYS3959, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3073, PHYS3973, COSC3011, COSC3911) **Assessment:** One 3-hour exam, quizzes and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Quantum Physics build on Intermediate Quantum Physics to cover more advanced topics, including atomic theory and spectroscopy, quantisation of the hydrogen atom, angular momentum in quantum mechanics, and perturbation theory.

The lectures on Plasma Physics aim to provide an understanding of the physics of fundamental phenomena in plasmas and to introduce the basic methods of theoretical and experimental plasma physics. The course includes a study of collective phenomena and sheaths, collisional processes, single particle motions, fluid models, equilibria, waves, electromagnetic properties, instabilities, and introduction to kinetic theory. Examples will be given, where appropriate, of the application of these concepts to naturally occurring and man-made plasmas.

The module on Computational Physics uses a mixture of lectures and computational lab sessions to explore problem solving using computers. It covers numerical schemes for solving ordinary and partial differential equations, with emphasis on choosing the best method to suit the problem, and on understanding numerical accuracy and stability. All coding is done in MATLAB, and no programming experience is assumed beyond that covered in Intermediate Physics.

Textbooks

Quantum Mechanics: A Paradigms Approach, D.H. McIntyre, C.A. Minogue, and J. Tate

PHYS3944
Quantum Physics/Plasma/Comp. Phys. (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 1 **Classes:** Forty six 1-hour lectures and eight 2-hour computer labs. **Prerequisites:** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (MATH2X21 or MATH2X61 or MATH2067) **Corequisites:** PHYS3040 or PHYS3940 or PHYS3941 **Prohibitions:** Any one of the following (PHYS3039, PHYS3939, PHYS3042, PHYS3942, PHYS3043, PHYS3943, PHYS3044, PHYS3047, PHYS3947, PHYS3048, PHYS3948, PHYS3054, PHYS3954, PHYS3055, PHYS3955, PHYS3059, PHYS3959, PHYS3060, PHYS3960, PHYS3961, PHYS3062, PHYS3962, PHYS3073, PHYS3973, COSC3011, COSC3911) **Assessment:** One 3-hour exam, quizzes and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3044, but with greater depth and some more challenging material.

Textbooks

A Modern Approach to Quantum Mechanics, J. Townsend

PHYS3068
Condensed Matter Phys/Optics and Lab

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Thirty-eight 1-hour lectures and six 4-hour experimental labs. **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944) and (PHYS3040 or PHYS3940 or PHYS3941) **Corequisites:** PHYS3090 or PHYS3990 or PHYS3991 **Prohibitions:** Any one of the following- (PHYS3968, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3062, PHYS3962, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3074, PHYS3974, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3067, PHYS3967) **Assessment:** One 2-hour exam, quizzes, assignments, and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Condensed Matter Physics provide a basic introduction to condensed matter systems, specifically the physics that underlies the electromagnetic, thermal, and optical properties of solids. The course draws on basic quantum theory and statistical mechanics and considers recent discoveries and new developments in semiconductors, nanostructures, magnetism, and superconductivity.

The lectures on Optics introduce some aspects of modern optics, using the laser to illustrate the applications. They cover the Lorentz model for the optical properties of matter, spontaneous and stimulated emission of light, rate equation analysis of lasers, diffraction, Gaussian beam propagation, anisotropic media and nonlinear optics.

In the Laboratory Classes, students will choose from a range of experiments that aim to give them an appreciation of the analytical, technical and practical skills required to conduct modern experimental work.

PHYS3968
Condensed Matter Phys/Optics and Lab (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Thirty-eight 1-hour lectures and six 4-hour experimental labs. **Prerequisites:** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and (PHYS3X42 or PHYS3X43 or PHYS3X44), and (PHYS3X40 or PHYS3941) **Corequisites:** PHYS3090 or PHYS3990 or PHYS3991 **Prohibitions:** Any one of the following (PHYS3068, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3062, PHYS3962, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3074, PHYS3974, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3067, PHYS3967) **Assessment:** One 2-hour exam, quizzes, assignments, and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3068, but with greater depth and some more challenging material.

PHYS3069
High Energy Physics/Optics and Lab

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Thirty-eight 1-hour lectures and six 4-hour experimental labs. **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS2013 or PHYS2913) and (PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944) and (PHYS3040 or PHYS3940 or PHYS3941) **Prohibitions:** Any one of the following: (PHYS3969, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3068, PHYS3968, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3074, PHYS3974, PHYS3076, PHYS3976, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3065, PHYS3965, PHYS3066, PHYS3966) **Assessment:** One 2-hour exam, quizzes, assignments, and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on High Energy Physics cover the basic constituents of matter, such as quarks and leptons, examining their fundamental properties and interactions. They include some discussion of extensions to the currently accepted Standard Model of Particle Physics, and of the relationships between High Energy Particle Physics, Cosmology and the early Universe.

The lectures on Optics introduce some aspects of modern optics, using the laser to illustrate the applications. They cover the Lorentz model for the optical properties of matter, spontaneous and stimulated emission of light, rate equation analysis of lasers, diffraction, Gaussian beam propagation, anisotropic media and nonlinear optics.

In the Laboratory Classes, students will choose from a range of experiments that aim to give them an appreciation of the analytical, technical and practical skills required to conduct modern experimental work.

PHYS3969
High Energy Physics/Optics and Lab (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Thirty-eight 1-hour lectures and six 4-hour experimental labs. **Prerequisites:** (A mark of 70 or above in PHYS2X11 and PHYS2X12 and PHYS2X13) and (PHYS3X42 or PHYS3X43 or PHYS3X44), and (PHYS3X40 or PHYS3941) **Prohibitions:** Any one of the following (PHYS3069, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3068, PHYS3968, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3074, PHYS3974, PHYS3076, PHYS3976, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3065, PHYS3965, PHYS3066, PHYS3966) **Assessment:** One 2-hour exam, quizzes, assignments, and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3069, but with greater depth and some more challenging material.

PHYS3074
Condensed Matter/High Energy and Lab

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Thirty-eight 1-hour lectures and six 4-hour experimental labs. **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS2013 or PHYS2913) and (PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944) **Corequisites:** PHYS3090 or PHYS3990 or PHYS3991 **Prohibitions:** Any one of the following (PHYS3974, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3067, PHYS3967) **Assessment:** One 2-hour exam, assignments, and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Condensed Matter Physics provide a basic introduction to condensed matter systems, specifically the physics that underlies the electromagnetic, thermal, and optical properties of solids. The course draws on basic quantum theory and statistical mechanics and considers recent discoveries and new developments in semiconductors, nanostructures, magnetism, and superconductivity.

The lectures on High Energy Physics cover the basic constituents of matter, such as quarks and leptons, examining their fundamental properties and interactions. They include some discussion of extensions to the currently accepted Standard Model of Particle Physics, and of the relationships between High Energy Particle Physics, Cosmology and the early Universe.

In the Laboratory Classes, students will choose from a range of experiments that aim to give them an appreciation of the analytical, technical and practical skills required to conduct modern experimental work.

PHYS3974
Condensed Matter/High Energy and Lab (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Thirty-eight 1-hour lectures and six 4-hour experimental labs. **Prerequisites:** (A mark of 70 or above in PHYS2X11 and PHYS2X12 and PHYS2X13) and (PHYS3X42 or PHYS3X43 or PHYS3X44) **Corequisites:** PHYS3090 or PHYS3990 or PHYS3991 **Prohibitions:** Any one of the following (PHYS3074, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3067, PHYS3967) **Assessment:** One 2-hour exam, assignments, and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3074, but with greater depth and some more challenging material.

PHYS3080
Condensed Matter/High Energy/Optics

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Fifty-seven 1-hour lectures **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS2013 or PHYS2913) and (PHYS3042 or PHYS3942 or PHYS3043 or PHYS3943 or PHYS3044 or PHYS3944) and (PHYS3040 or PHYS3940 or PHYS3941) **Corequisites:** PHYS3090 or PHYS3990 or PHYS3991 **Prohibitions:** Any one of the following (PHYS3980, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3074, PHYS3974, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3067, PHYS3967) **Assessment:** One 3-hour exam, quizzes and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Condensed Matter Physics provide a basic introduction to condensed matter systems, specifically the physics that underlies the electromagnetic, thermal, and optical properties of solids. The course draws on basic quantum theory and statistical mechanics and considers recent discoveries and new developments in semiconductors, nanostructures, magnetism, and superconductivity.

The lectures on High Energy Physics cover the basic constituents of matter, such as quarks and leptons, examining their fundamental properties and interactions. They include some discussion of extensions to the currently accepted Standard Model of Particle Physics, and of the relationships between High Energy Particle Physics, Cosmology and the early Universe.

The lectures on Optics introduce some aspects of modern optics, using the laser to illustrate the applications. They cover the Lorentz model for the optical properties of matter, spontaneous and stimulated emission of light, rate equation analysis of lasers, diffraction, Gaussian beam propagation, anisotropic media and nonlinear optics.

PHYS3980
Condensed Matter/High Energy/Optics(Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Fifty-seven 1-hour lectures. **Prerequisites:** (A mark of 70 or above in PHYS2X11 and PHYS2X12 and PHYS2X13) and (PHYS3X42 or PHYS3X43 or PHYS3X44) and (PHYS3X40 or PHYS3941) **Corequisites:** PHYS3090 or PHYS3990 or PHYS3991 **Prohibitions:** Any one of the following (PHYS3080, PHYS3050, PHYS3950, PHYS3053, PHYS3953, PHYS3056, PHYS3956, PHYS3058, PHYS3958, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3069, PHYS3969, PHYS3070, PHYS3970, PHYS3071, PHYS3971, PHYS3073, PHYS3973, PHYS3074, PHYS3974, PHYS3075, PHYS3975, PHYS3076, PHYS3976, PHYS3077, PHYS3977, PHYS3078, PHYS3978, PHYS3079, PHYS3979, PHYS3081, PHYS3981, PHYS3082, PHYS3982, PHYS3046, PHYS3946, PHYS3047, PHYS3947, PHYS3049, PHYS3949, PHYS3063, PHYS3963, PHYS3064, PHYS3964, PHYS3065, PHYS3965, PHYS3066, PHYS3966, PHYS3067, PHYS3967) **Assessment:** One 3-hour exam, quizzes and assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3080, but with greater depth and some more challenging material.

PHYS3099
Stat. Mechanics/Cond. Matter and Lab

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Thirty eight 1-hour lectures and six 4-hour experimental labs. **Prerequisites:** (PHYS2011 or PHYS2911) and (PHYS2012 or PHYS2912) and (PHYS3039 or PHYS3939) **Prohibitions:** Any one of the following (PHYS3090, PHYS3990, PHYS3999, PHYS3062, PHYS3962, PHYS3068, PHYS3968, PHYS3074, PHYS3974, PHYS3079, PHYS3979, PHYS3080, PHYS3980, PHYS3081, PHYS3981) **Assessment:** One 1.5-hour exam, one 1-hour exam, assignments and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lectures on Statistical Mechanics aim to provide a theoretical foundation for statistical mechanics, including both classical and quantum distributions.

The lectures on Condensed Matter Physics provide a basic introduction to condensed matter systems, specifically the physics that underlies the electromagnetic, thermal, and optical properties of solids. The course draws on basic quantum theory and statistical mechanics and considers recent discoveries and new developments in semiconductors, nanostructures, magnetism, and superconductivity.

In the Laboratory Classes, students will choose from a range of experiments that aim to give them an appreciation of the analytical, technical and practical skills required to conduct modern experimental work.

Textbooks
An Introduction to Thermal Physics, David V. Schroeder.

PHYS3999
Stat. Mechanics/Cond. Matter and Lab (Adv)

Credit points: 6 **Teacher/Coordinator:** A/Prof Boris Kuhlmey **Session:** Semester 2 **Classes:** Thirty eight 1-hour lectures and six 4-hour experimental labs. **Prerequisites:** (A mark of 70 or above in both PHYS2X11 and PHYS2X12) and PHYS3X39 **Prohibitions:** PHYS3090 or PHYS3990 or PHYS3099 or PHYS3062 or PHYS3962 or PHYS3068 or PHYS3968 or PHYS3074 or PHYS3974 or PHYS3079 or PHYS3979 or PHYS3080 or PHYS3980 or PHYS3081 or PHYS3981 **Assessment:** One 1.5-hour exam, one 1-hour exam, assignments and laboratory reports (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the same topics as PHYS3099, but with greater depth and some more challenging material.

Textbooks
An Introduction to Thermal Physics, David V. Schroeder

Table 1: Plant Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Plant Science			
For a major in Plant Science, the minimum requirement is 24 credit points from senior units of study listed in this subject area, which must include BIOL3043/3943, two additional senior BIOL units, and one of PPAT3003 or HORT3005.			
Intermediate units of study			
BIOL2009 **Intro to Terrestrial Field Ecology**	6	**A** Basic experimental design and statistical analysis. **P** 12cp from (BIOL1XXX, MBLG1XXX) **N** BIOL2909 or BIOL3009 or BIOL3909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered.*	Intensive July
BIOL2909 **Intro to Terrestrial Field Ecology (Adv)**	6	**A** Basic experimental design and statistical analysis. **P** An average of 75 or above in 12cp from (BIOL1XXX, MBLG1XXX) **N** BIOL2009 or BIOL3009 or BIOL3909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered.*	Intensive July
BIOL2029 **Cells**	6	**P** BIOL1XX7 or MBLG1XXX **N** BIOL2016 or BIOL2916 or BIOL2929	Semester 1
BIOL2929 **Cells (Advanced)**	6	**P** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) **N** BIOL2016 or BIOL2916 orBIOL2029	Semester 1
BIOL2022 **Biology Experimental Design and Analysis**	6	**A** BIOL1XXX or MBLG1XXX **P** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **N** BIOL2922 or BIOL3006 or BIOL3906	Semester 2
BIOL2922 **Biol Experimental Design and Analysis Adv**	6	**A** BIOL1XXX or MBLG1XXX **P** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1002 or DATA1001 or MATH1XX5)] **N** BIOL2022 or BIOL3006 or BIOL3906	Semester 2
BIOL2030 **Botany**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **N** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2930	Semester 1
BIOL2930 **Botany (Advanced)**	6	**A** Knowledge of concepts and skills in BIOL1XX6. **P** Annual average mark of at least 70 in previous year **N** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2030	Semester 1
BIOL2024 **Ecology and Conservation**	6	**A** BIOL1XXX or MBLG1XXX **N** BIOL2924	Semester 2
BIOL2924 **Ecology and Conservation (Advanced)**	6	**A** BIOL1XXX or MBLG1XXX **P** An annual average mark of at least 70 in the previous year **N** BIOL2024	Semester 2
GEGE2001 **Genetics and Genomics**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **N** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072	Semester 1 Semester 2
GEGE2901 **Genetics and Genomics (Advanced)**	6	**A** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **P** Annual average mark of at least 70 **N** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972	Semester 1 Semester 2
Senior units of study			
BIOL3007 **Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3907	Semester 2
BIOL3907 **Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3007	Semester 2
BIOL3009 **Terrestrial Field Ecology**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3909 or BIOL2009 or BIOL2909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.*	Intensive July

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
BIOL3909 **Terrestrial Field Ecology (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3009 or BIOL2009 or BIOL2909 *Note: Department permission required for enrolment* *This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered. This unit is not offered from 2019.*	Intensive July
BIOL3026 **Developmental Genetics**	6	**P** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **N** BIOL3926	Semester 2
BIOL3926 **Developmental Genetics (Advanced)**	6	**P** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **N** BIOL3929 or BIOL3026	Semester 2
BIOL3043 **Plant Science**	6	**P** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3943 or PLNT3001 or PLNT3901 or PLNT3002 or PLNT3902	Semester 2
BIOL3943 **Plant Science (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3043 or PLNT3001 or PLNT3901 or PLNT3002 or PLNT3902	Semester 2
BIOL3044 **Evolution and Biodiversity**	6	**P** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3944 or BIOL3025 or BIOL3925 or PLNT3003 or PLNT3903	Semester 1
BIOL3944 **Evolution and Biodiversity (Advanced)**	6	**P** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **N** BIOL3044 or BIOL3025 or BIOL3925 or PLNT3003 or PLNT3903	Semester 1
HORT3005 **Production Horticulture**	6	**P** (AGEN2001 and AGEN2005) or BIOL2X30 or BIOL2X31 or BIOL2X23 or AGEN2002 or AGRI2001	Semester 1
PPAT3003 **Plant Health and Disease**	6	**P** 6 credit points of Microbiology units	Semester 1

Plant Science

For a major in Plant Science, the minimum requirement is 24 credit points from senior units of study listed in this subject area, which must include BIOL3043/3943, two additional senior BIOL units, and one of PPAT3003 or HORT3005.

Intermediate units of study

BIOL2009
Intro to Terrestrial Field Ecology

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** Note: One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** 12cp from (BIOL1XXX, MBLG1XXX) **Prohibitions:** BIOL2909 or BIOL3009 or BIOL3909 **Assumed knowledge:** Basic experimental design and statistical analysis. **Assessment:** Two in-class quizzes (20%), major research report (40%), sampling project report (20%), research proposal and presentation (10%), data collection and analysis in teams (10%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Field experience

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered.

This intensive field-based course provides a practical introduction in the experimental analysis of terrestrial populations and assemblages. The experience is best suited to students who will continue into senior units of study in ecology. Students learn a broad range of ecological sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. The field work takes place in native forest and incorporates survey techniques for plants, small mammals and other fauna and thus provides a good background for ecological consulting work and an introduction into large-scale project management. Students attend a week-long field course and participate in a large-scale research project as part of a large team, as well as conducting a research project that they design with a small group of students. Emphasis is placed on critical thinking in the context of environmental management and technical skills are developed in the area of data handling and analysis, report writing and team work. Invited experts contribute to the lectures and discussions on issues relating to the ecology, conservation and management of Australia's terrestrial flora and fauna.

BIOL2909
Intro to Terrestrial Field Ecology (Adv)

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** Note: One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** An average of 75 or above in 12cp from (BIOL1XXX, MBLG1XXX) **Prohibitions:** BIOL2009 or BIOL3009 or BIOL3909 **Assumed knowledge:** Basic experimental design and statistical analysis. **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), specimen collection (10%), research project report (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Field experience

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any intermediate BIOL units of study may also be considered.

This unit has the same objectives as BIOL2009 Terrestrial Field Ecology, and is suitable for qualified students who wish to pursue certain aspects at a more advanced level. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study will participate in alternatives to some elements of the standard course and will be required to pursue the objectives by more independent means. Specific details of this unit of study and assessment will be announced in meetings with students at the beginning of the unit.

This intensive field-based course provides a practical introduction in the experimental analysis of terrestrial populations and assemblages. The experience is best suited to students who will continue into senior units of study in ecology. Students learn a broad range of ecological sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. The field work takes place in native forest and incorporates survey techniques for plants, small mammals and other fauna and thus provides a good background for ecological consulting work and an introduction into large-scale project management. Students attend a week-long field course and participate in a large-scale research project as part of a large team as well as conducting a research project that they design with a small group of students. Emphasis is placed on critical thinking in the context of environmental management and technical skills are developed in the area of data handling and analysis, report writing and team work. Invited experts contribute to the lectures and discussions on issues relating to the ecology, conservation and management of Australia's terrestrial flora and fauna.

BIOL2029
Cells

Credit points: 6 **Teacher/Coordinator:** Dr Murray Thomson **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 4-hour practical per week **Prerequisites:** BIOL1XX7 or MBLG1XXX **Prohibitions:** BIOL2016 or BIOL2916 or BIOL2929 **Assessment:** 3-hour theory exam (60%), quizzes (lectures and laboratory work) (10%), marks for laboratory work (10%), report (20%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cell Biology is one of the most dynamic areas in science today. During development, a single cell zygote must undergo numerous divisions to become a multi-cellular organism. In both plants and animals, cell to cell communication and coordination of the cell cycle, as well as cellular division and migration, are vital for normal development. Stem cells follow specialisation pathways to become increasingly committed to differentiation, and transformation into specialised cells that group together to form the variety of tissues that make up animals and plants. In this unit you will investigate, the diversity of cell types, how these different cells interact with each other, how the cell cycle is controlled as well as studying the roles of cellular movement, differentiation and interaction in reproduction and development. In Cells you will develop a deep understanding of the established knowledge base and develop research skills to extend this knowledge. Discussions will incorporate recent advances in cell research including the regenerative potential of stem cells and their use in treatments to replace damaged and diseased tissue. The laboratory program, provides you with hands on training in key techniques such as in vitro cell culture, organelle isolation and experimentation, as well as microscopy. These skills will prepare you for a research pathway and/or a career that includes cell biology.

Textbooks

Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P. (2014) Molecular Biology of the Cell (Sixth edition). Garland Publishing Inc., New York and London (ISBN-9780815344643)

BIOL2929
Cells (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Murray Thomson **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 4-hour practical per week **Prerequisites:** A mark of at least 70 from (BIOL1XX7 or MBLG1XX1) **Prohibitions:** BIOL2016 or BIOL2916 orBIOL2029 **Assessment:** 3-hour theory exam (60%), quizzes (lectures and laboratory work) (10%), marks for laboratory work (10%), advanced report (20%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Cell biology is one of the most dynamic areas of modern research. During development, a single cell zygote must undergo numerous divisions to become a multi-cellular organism. In both plants and animals, cell-to-cell communication and coordination of the cell cycle, as well as cellular division and migration, are vital for normal development. Stem cells follow specialisation pathways to become increasingly committed to differentiation, and transformation into specialised cells that group together to form the variety of tissues that make up animals and plants. In this unit you will investigate, the diversity of cell types, how these different cells interact with each other, how the cell cycle is controlled as well as studying the roles of cellular movement, differentiation and interaction in reproduction and development. In Cells you will develop a deep understanding of the established knowledge base and develop research skills to extend this knowledge. Discussions will incorporate recent advances in cell research including the regenerative potential of stem cells and their use in treatments to replace damaged and diseased tissue. The advanced program, will provide you with an opportunity to complete an authentic research project in a specialized area of cell biology.

Textbooks

Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P. (2014) Molecular Biology of the Cell (Sixth edition). Garland Publishing Inc., New York and London (ISBN-9780815344643)

BIOL2022
Biology Experimental Design and Analysis

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** 6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5) **Prohibitions:** BIOL2922 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides foundational skills essential for doing research in biology and for critically judging the research of others. We consider how biology is practiced as a quantitative, experimental and theoretical science. We focus on the underlying principles and practical skills you need to explore questions and test hypotheses, particularly where background variation (error) is inherently high. In so doing, the unit provides you with an understanding of how biological research is designed, analysed and interpreted using statistics. Lectures focus on sound experimental and statistical principles, using examples in ecology and other fields of biology to demonstrate concepts. In the practical sessions, you will design and perform, analyse (using appropriate statistical tools) and interpret your own experiments to answer research questions in topics relevant to your particular interest. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and M. J. Keough. 2002. Experimental Design and Data Analysis for Biologists. 1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2922
Biol Experimental Design and Analysis Adv

Credit points: 6 **Teacher/Coordinator:** A/Prof Clare McArthur **Session:** Semester 2 **Classes:** Two lectures per week and one 3-hour practical per week. **Prerequisites:** [An annual average mark of at least 70 in the previous year] and [6cp from (BIOL1XXX or MBLG1XXX or ENVX1001 or ENVX1002 or DATA1001 or MATH1XX5)] **Prohibitions:** BIOL2022 or BIOL3006 or BIOL3906 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (60%), one 2-hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2922 will be based on BIOL2022 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Required: Ruxton, G. and Colegrave, N. 2016. Experimental design for the life sciences. 4th Ed. Oxford
University Press
Recommended: Quinn, G. P. and Keough, 2002. Experimental Design and Data Analysis for Biologists.1st Ed. Cambridge University Press, Cambridge.
Recommended: Field, A. 2013. Discovering statistics using SPSS. 4th Ed. SAGE Publications, London.

BIOL2030
Botany

Credit points: 6 **Teacher/Coordinator:** A/Prof Rosanne Quinnell **Session:** Semester 1 **Classes:** Two 1-hour lecture/week; one 3-hour practical/week; a series of five 1-hour tutorial/week in the latter part of the semester **Prohibitions:** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2930 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quizzes (15%), anatomy project report and presentation (20%), practical exam (30%), theory exam (35%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are surrounded by plants, and rely on them every day for our wellbeing. Ecologists use botanical knowledge to help manage marine and terrestrial ecosystems, and public health and land management professionals depend on their understanding of plant science to help solve environmental problems and to enhance biosecurity. Botany aims to increase and improve our supply of medicines, foods, and other plant products, and is critical for anyone interested in contributing to the sustainable future of our planet. In this unit, you will explore the origins, diversity, and global significance of plants. You will gain insights into the micro- and macro-evolutionary processes and patterns behind how plants moved from aquatic ecosystems to terrestrial ecosystems. Integrated lectures, practical classes, and extensive online resources will allow you to develop and integrate practical skills and conceptual frame works in plant identification, plant physiology, plant anatomy, and plant morphology. Lectures and practical classes are augmented by self-instructional audio-visual sessions and by small group discussions to foster a sense of self-reliance and collaboration. Successful completion of BIOL2023 will allow you to contribute to a range of disciplines including: ecology, bioinformatics, molecular and cell biology, genetics and biotechnology, environmental law, agriculture, education and the arts.

Textbooks

Evert RF and Eichhorn SE. 2013. Raven: Biology of Plants. 8th Ed. Freeman and Co Publishers. New York. NY.
**School of Life and Env Sci. 201x. Botany and Botany Adv Study guide.
Additional reading:
Attwell BJ, Kriedeman PE, Turnbull CGN. 1999. Plants In Action. Macmillan, South Yarra. (Australian Plant Biology with a good section on ecophysiology).
Judd WS, Campbell CS, Kellogg EA, Stephens PF. 2007. Plant Systematics: a phylogenetic approach. 3rd Ed. Sinauer Associates Inc Massachusetts USA
Pellow B, Henwood M, Carolin R.C., 2009. Flora of the Sydney Region. 5th edition. Sydney University Press.
Simpson, MG. 2010. Plant Systematics Ed 2 Academic press (or Ed 1 2006)
Taiz L. Zeiger E. 2010. Plant Physiology. 5th Ed Sinauer. Sunderland, Mass.
Online learning resources:
Â¿LMS (currently BlackBoard)
Â¿BotanyOnline: http://botany.sydneybiology.org/

BIOL2930
Botany (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Rosanne Quinnell **Session:** Semester 1 **Classes:** Two 1-hour lectures/week; one 3-hour practical/week; a series of five 1-hour tutorial/week in the latter part of the semester **Prerequisites:** Annual average mark of at least 70 in previous year **Prohibitions:** BIOL2023 or BIOL2923 or AGEN2001 or PLNT2001 or PLNT2901 or PLNT2002 or PLNT2902 or PLNT2003 or PLNT2903 or AGEN2005 or BIOL2030 **Assumed knowledge:** Knowledge of concepts and skills in BIOL1XX6. **Assessment:** Online quizzes (15%), advanced project report (20%), practical exam (30%), theory exam (35%) **Practical field work:** null **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

We are surrounded by plants, and rely on them every day for our wellbeing. Ecologists use botanical knowledge to help manage marine and terrestrial ecosystems, and public health and land management professionals depend on their understanding of plant science to help solve environmental problems and to inform biosecurity. Botany aims to increase and improve our supply of medicines, foods, and other plant products, and is critical for anyone interested in contributing to the sustainable future of our planet. In this unit, you will explore the origins, diversity, and global significance of plants. You will gain insights into the micro- and macro-evolutionary processes and patterns behind how plants moved from aquatic ecosystems to terrestrial ecosystems. Integrated lectures, practical classes and extensive online resources will allow you to develop and integrate practical skills and conceptual frameworks in plant identification, and plant physiology, morphology and anatomy. Lectures and practical classes are augmented by discussions to foster a sense of self-reliance and collaboration. The Advanced Botany unit of study requires engagement at a high standard of academic rigour and affords opportunities to engage with core aspect of Botany at depth and to create new knowledge. In partnership with academic staff advanced students will undertake an independent research project, which will develop skills in research and communication.

Textbooks

Attwell BJ, Kriedeman PE, Turnbull CGN. 1999. Plants In Action. Macmillan, South Yarra. (Australian Plant Biology with a good section on ecophysiology).
Judd WS, Campbell CS, Kellogg EA, Stephens PF. 2007. Plant Systematics: a phylogenetic approach. 3rd Ed. Sinauer Associates Inc Massachusetts USA
Pellow B, Henwood M, Carolin R.C., 2009. Flora of the Sydney Region. 5th edition. Sydney University Press.
Simpson, MG. 2010. Plant Systematics Ed 2 Academic press (or Ed 1 2006)
Taiz L. Zeiger E. 2010. Plant Physiology. 5th Ed Sinauer. Sunderland, Mass.
**Essential.
Online learning resources:
Â¿LMS (currently BlackBoard)
Â¿BotanyOnline: http://botany.sydneybiology.org/

BIOL2024
Ecology and Conservation

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prohibitions:** BIOL2924 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study examines the ecological principles driving the major ecosystems of the world and ecological processes behind the world's major conservation issues. It aims to develop in students the core foundations for an understanding of Ecology and its application in conservation. Lectures will focus on the ecology of the major terrestrial and marine biomes of the world. Application of ecological theory and methods to practical conservation problems will be integrated throughout the unit of study. Practical sessions will provide hands-on experience in ecological sampling and data handling to understand the ecology of marine and terrestrial environments, as well as ecological simulations to understand processes. This unit of study provides a suitable foundation for senior biology units of study.

Textbooks

Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John
Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

BIOL2924
Ecology and Conservation (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Banks **Session:** Semester 2 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An annual average mark of at least 70 in the previous year **Prohibitions:** BIOL2024 **Assumed knowledge:** BIOL1XXX or MBLG1XXX **Assessment:** Practical reports/presentations (50%), one 2-hour exam (50%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content of BIOL2924 will be based on BIOL2024 but qualified students will participate in alternative components at a more advanced level. The content and nature of these components may vary from year to year.

Textbooks

Recommended: Essentials of Ecology 4th edition (2014). Townsend, CR, Begon, M, Harper, JL . John
Wiley and Sons
Recommended: The Ecological World View (2010) Krebs, CJ; CSIRO Publishing

GEGE2001
Genetics and Genomics

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prohibitions:** GENE2002 or MBLG2972 or GEGE2901 or MBLG2072 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution.

GEGE2901
Genetics and Genomics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Peter Sharp **Session:** Semester 1, Semester 2 **Classes:** Two lectures; one 3-hour practical session; and one peer assisted study session on a weekly basis **Prerequisites:** Annual average mark of at least 70 **Prohibitions:** GENE2002 or MBLG2072 or GEGE2001 or MBLG2972 **Assumed knowledge:** Mendellian genetics, mechanisms of evolution, molecular and chromosomal bases of inheritance, and gene regulation and expression. **Assessment:** Assignments, quizzes, presentation, final exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The era of genomics has revolutionised our approach to biology. Recent breakthroughs in genetics and genomic technologies have led to improvements in human and animal health, in breeding and selection of economically important organisms and in the curation and care of wild species and complex ecosystems. In this unit, students will investigate/describe ways in which modern biology uses genetics and genomics to study life, from the unicellular through to complex multicellular organisms and their interactions in communities and ecosystems. This unit includes a solid foundation in classical Mendelian genetics and its extensions into quantitative and population genetics. It also examines how our ability to sequence whole genomes has changed our capacities and our understanding of biology. Links between DNA, phenotype and the performance of organisms and ecosystems will be highlighted. The unit will examine the profound insights that modern molecular techniques have enabled in the fields of developmental biology, gene regulation, population genetics and molecular evolution. The Advanced mode of Genetics and Genomics will provide you with challenge and a higher level of academic rigour. You will have the opportunity to plan and carry out a project that will develop your skills in contemporary genetics/molecular biology techniques and will provide you with a greater depth of disciplinary understanding. The Advanced mode will culminate in a written report and in an oral presentation where you will discuss a recent breakthrough that has been enabled by the use of modern genetics and genomics technologies. This is a unit for anyone wanting to better understand the how genetics has shaped the earth and how it will shape the future.

Textbooks
TBA

Senior units of study

BIOL3007
Ecology

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3907 **Assessment:** One 2-hour exam, group presentations, one essay, one project report (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the dynamics of ecological systems, and considers the interactions between individual organisms and populations, organisms and the environment, and ecological processes. Lectures are grouped around four dominant themes: Interactions, Evolutionary Ecology, The Nature of Communities, and Conservation and Management. Emphasis is placed throughout on the importance of quantitative methods in ecology, including sound planning and experimental designs, and on the role of ecological science in the conservation, management, exploitation and control of populations. Relevant case studies and examples of ecological processes are drawn from marine, freshwater and terrestrial systems, with plants, animals, fungi and other life forms considered as required. Students will have some opportunity to undertake short term ecological projects, and to take part in discussions of important and emerging ideas in the ecological literature.

Textbooks
Begon M, Townsend CR, Harper JL (2005) Ecology, From individuals to ecosystems. Wiley-Blackwell.

BIOL3907
Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Dieter Hochuli **Session:** Semester 2 **Classes:** Two lectures per week, weekly tutorial and 3-hour practical per week **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3007 **Assessment:** One 2-hour exam, presentations, one essay, one project report (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has the same objectives as BIOL3007 Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from the applicants on the basis of their previous performance. Students taking this unit of study participate in alternatives to some elements of the standard course and will be encouraged to pursue the objectives by more independent means in a series of research tutorials. Specific details of this unit of study and assessment will be announced in meetings with students in week 1 of semester 2. This unit of study may be taken as part of the BSc (Advanced) program.

Textbooks
As for BIOL3007

BIOL3009
Terrestrial Field Ecology

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** Note: One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3909 or BIOL2009 or BIOL2909 **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), specimen collection (10%), research project report (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered.

This intensive field-based course provides practical experience in terrestrial ecology suited to a broad range of careers in ecology, environmental consulting and wildlife management. Students learn a broad range of ecological sampling techniques and develop a detailed understanding of the logical requirements necessary for manipulative ecological field experiments. The field work takes place in native forest and incorporates survey techniques for plants, small mammals and invertebrates and thus provides a good background for ecological consulting work and an introduction into large-scale project management. Students attend a week-long field course and participate in a large-scale research project as well as conducting their own research project. Emphasis is placed on critical thinking in the context of environmental management and technical skills are developed in the area of data handling and analysis, report writing and team work. Invited experts contribute to the lectures and discussions on issues relating to the ecology, conservation and management of Australia's terrestrial flora and fauna.

BIOL3909
Terrestrial Field Ecology (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Glenda Wardle **Session:** Intensive July **Classes:** One 6-day field trip held in the pre-semester break and four 4-hour practical classes during weeks 1-4 of semester 2 **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3009 or BIOL2009 or BIOL2909 **Assessment:** Discussions and quiz (10%), research project proposal and brief presentation (10%), sampling project report (20%), sample and data processing (10%), research project report (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Block mode

Note: Department permission required for enrolment. Note: This unit requires School permission to enrol; please see the School of Life and Environmental Sciences website for details on how to apply. Entry into the unit is based on placement availability and selection is competitive based on academic performance in the pre-requisite units of study. Academic performance in any Senior BIOL units of study may also be considered. This unit is not offered from 2019.

This unit has the same objectives as BIOL3009 Terrestrial Field Ecology, and is suitable for students who wish to pursue certain aspects in greater depth. Entry is restricted, and selection is made from applicants on the basis of previous performance. Students taking this unit of study will complete an individual research project on a topic negotiated with a member of staff. It is expected that much of the data collection will be completed during the field trip but some extra time may be needed during semester 2. Specific details of this unit of study and assessment will be announced in meetings with students at the beginning of the unit. This unit of study may be taken as part of the BSc (Advanced) program.

BIOL3026
Developmental Genetics

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** (MBLG2X72 or GEGE2X01 or GENE2002) and 6cp from (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX) **Prohibitions:** BIOL3926 **Assessment:** One 2-hour exam, assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Developmental genetics discusses major concepts and our current understanding of developmental biology with an emphasis on molecular genetics. The developmental genetics of animal and plant systems will be investigated, along with approaches used to determine gene function in relation to development of complex multicellular organisms. Topics include the features and resources for model organisms; the generation of mutants for forward and reverse genetics; the application of mutants to the study gene function and gene networks; spatial and temporal gene expression in pattern formation; quantitative trait loci analysis; utility of genome wide association studies; epigenetics in relation to inheritance; genome information in the study of human genetics. Reference will be made to the use of modern techniques in developmental biology such as transgenics, recombinant DNA technology, tissue-specific expression analysis. Various methods of genetic mapping will be covered. Practical work complements the theoretical aspects of the course and develops important skills in genetics.

BIOL3926
Developmental Genetics (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Jenny Saleeba **Session:** Semester 2 **Classes:** 24 1-hour lectures/tutorials per semester and up to 3 hours laboratory per week. **Prerequisites:** An average mark of 75 or above in [(MBLG2X72 or GEGE2X01 or GENE2002) and (MBLG2X71 or BIOL2XXX or BCMB2XXX or QBIO2001 or IMMU2XXX)] **Prohibitions:** BIOL3929 or BIOL3026 **Assessment:** One 2-hour exam, assignments (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Qualified students will participate in alternative components to BIOL3026 Developmental Genetics. The content and nature of these components may vary from year to year. Some assessment will be in an alternative format to components of BIOL3026.

BIOL3043
Plant Science

Credit points: 6 **Teacher/Coordinator:** A/Prof Charles Warren **Session:** Semester 2 **Classes:** Two lectures and one 4-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp from BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3943 or PLNT3001 or PLNT3901 or PLNT3002 or PLNT3902 **Assessment:** Practical report (25%), lab notebook (10%), group presentation (15%), one 2-hour exam (50%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores major concepts, discoveries and controversies in the plant sciences. Lectures will examine the mechanisms plants employ to adapt and acclimate to the environment. Major topics include growth and development, acquisition of resources such as light and nutrients, perception and response to signals, and interactions of plants with other organisms. Emphasis will be placed on integration of plant responses from molecular through to whole plant scales. There is a focus on recent research that has been critical in enhancing our current understanding of plant biology. Lectures are augmented by experimental work. This unit of study complements other Senior units of study in the Plant Science Major and is essential for those seeking a career in plant biology.

BIOL3943
Plant Science (Advanced)

Credit points: 6 **Teacher/Coordinator:** A/Prof Charles Warren **Session:** Semester 2 **Classes:** Two lectures and one 4-hour practical per week. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3043 or PLNT3001 or PLNT3901 or PLNT3002 or PLNT3902 **Assessment:** Manuscript (25%), lab notebook (10%), group presentation (15%), one 2-hour exam (50%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content will be based on the standard unit BIOL3043 but qualified students will undertake an indivual project and prepare a manuscript. This unit explores major concepts, discoveries and controversies in the plant sciences. Lectures will examine the mechanisms plants employ to adapt and acclimate to the environment. Major topics include growth and development, acquisition of resources such as light and nutrients, perception and response to signals, and interactions of plants with other organisms. Emphasis will be placed on integration of plant responses from molecular through to whole plant scales. There is a focus on recent research that has been critical in enhancing our current understanding of plant biology. Lectures are augmented by experimental work. This unit of study complements other Senior units of study in the Plant Science Major and is essential for those seeking a career in plant biology.

BIOL3044
Evolution and Biodiversity

Credit points: 6 **Teacher/Coordinator:** Prof Ben Oldroyd **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3944 or BIOL3025 or BIOL3925 or PLNT3003 or PLNT3903 **Assessment:** Practical reports and/or presentations (60%), one 2-hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

How did the diversity of life arise? Why are there so many species? Why do animals and plants seem so well designed for their environments? How do we explain patterns of distribution across continents? These are some of the key questions that we will examine in this Unit. The Unit begins with a survey of the history of evolutionary thought, and the so-called 'new synthesis'; the melding of Darwinian evolution, systematics and genetics. The Unit will provide training in the principles, methods, and applications of evolutionary biology including systems of classification, the genetics of speciation and hybrid zones, molecular evolution, reconstruction of phylogenies, population genetics, historical interpretation of geographic distributions, evolution of sex, adaptation, human evolution, and selfish gene theory. Examples from a broad range of organisms and data sources will be used throughout the Unit. This Unit is valuable for students who intend to seek employment in areas such as biodiversity research, bioinformatics, ecology, taxonomy, biological conservation and teaching.

Textbooks

Freeman and Herron (2011) Evolutionary Analysis, Pearson/Prentice Hall

BIOL3944
Evolution and Biodiversity (Advanced)

Credit points: 6 **Teacher/Coordinator:** Prof Ben Oldroyd **Session:** Semester 1 **Classes:** Two lectures and one 3-hour practical per week. **Prerequisites:** An average mark of 75 or above in [12cp of BIOL2XXX] OR [6cp of BIOL2XXX and (MBLG2X72 or GEGE2X01 or GENE2002)] **Prohibitions:** BIOL3044 or BIOL3025 or BIOL3925 or PLNT3003 or PLNT3903 **Assessment:** Practical reports and/or presentations (60%), one 2-hour exam (40%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The content will be based on the standard unit BIOL3044 but qualified students will participate in alternative components at a more advanced level. How did the diversity of life arise? Why are there so many species? Why do animals and plants seem so well designed for their environments? How do we explain patterns of distribution across continents? These are some of the key questions that we will examine in this Unit. The Unit begins with a survey of the history of evolutionary thought, and the so-called 'new synthesis'; the melding of Darwinian evolution, systematics and genetics. The Unit will provide training in the principles, methods, and applications of evolutionary biology including systems of classification, the genetics of speciation and hybrid zones, molecular evolution, reconstruction of phylogenies, population genetics, historical interpretation of geographic distributions, evolution of sex, adaptation, human evolution, and selfish gene theory. Examples from a broad range of organisms and data sources will be used throughout the Unit. This Unit is valuable for students who intend to seek employment in areas such as biodiversity research, bioinformatics, ecology, taxonomy, biological conservation and teaching.

Textbooks

Freeman and Herron (2011) Evolutionary Analysis, Pearson/Prentice Hall

HORT3005
Production Horticulture

Credit points: 6 **Teacher/Coordinator:** Prof Daniel Tan **Session:** Semester 1 **Classes:** Two 1-hour lectures; one 3-hour practical/workshop per week **Prerequisites:** (AGEN2001 and AGEN2005) or BIOL2X30 or BIOL2X31 or BIOL2X23 or AGEN2002 or AGRI2001 **Assessment:** One 3-hour exam (55%), three assignments (45%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers topics on the production of high quality food from perennial fruit crops, wine grapes, vegetables. It also covers the key aspects of the postharvest handling and quality assurance of fresh produce. At the end of this unit students are expected to have a detailed understanding of these areas of horticultural food production and be able to discuss related literature and the physiological principles underlying the commercial success of these horticultural enterprises. Students will also gain research and enquiry skills through research based practical sessions and assignments.

Textbooks

Recommended reading:

Louis Glowinski (2008) The complete book of fruit growing in Australia.

Lothian Books, Westwood, M.N. (1993) Temperate-zone pomology. Timber Press Inc.

Jackson, J.E (2003) Biology of apples and pears. Cambridge University Press.

Gopinadhan Paliyath et al. (Ed.) (2008) Postharvest biology and technology of fruits, vegetables, and flowers. Oxford: Wiley-Blackwell

Decoteau, D/. R (2000). Vegetable Crops. Upper Saddle River, NJ: Prentice Hall

PPAT3003
Plant Health and Disease

Credit points: 6 **Teacher/Coordinator:** Prof David Guest (coordinator), A/Prof Michael Kertesz, Dr Rosalind Deaker, Prof Robert Park **Session:** Semester 1 **Classes:** 26 one-hour lectures and 12 three-hour practical classes **Prerequisites:** 6 credit points of Microbiology units **Assessment:** Take-home quizzes (20%), project report (10%), practical exam (20%), end of semester exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit explores the impacts of microbes on plant productivity, food security and the management of natural environments. The lecture component discusses how microbes interact with plants at the ecosystem, whole plant, cellular and molecular levels, conditioning nutrient availability and acquisition, growth, yield, quality and environmental responses. The biology and epidemiology of plant-associated microbes, infection processes, colonisation strategies, plant responses and breeding for disease resistance will be discussed. The practical component introduces techniques used in handling, measuring and identifying plant-associated fungi and bacteria, diagnosis of plant disease and investigations of plant-microbe interactions, and develops skills in enquiry and problem solving through experimental design, execution and interpretation of data. Students learn to work in a research team, plan effective work schedules, work safely in a research laboratory with a range of scientific equipment, keep appropriate records, and use statistical analysis and simulations in research. The unit is core to the BScAgr degree and is available as an elective to BEnvSys and BSc students.

Textbooks

Schumann GL and Darcy CJ 2010. Essential Plant Pathology (2nd ed.). APS Press, St Paul, Minn., USA

Table 1: Psychology

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Psychology			
For a major in Psychology, the minimum requirement is 48 credit points across Intermediate and Senior Psychology* units of study, including (PSYC2010/2910 or PSYC2011/2911), PSYC2012, PSYC2013, and PSYC2014. No other Intermediate Psychology units can be counted towards a major. Students must complete at least 24 credit points of Senior Psychology units for a major (or 30 credit points of Senior Psychology units for students in the BPsych degree). PSYC3018 must be included for students who have not completed PSYC2010/2910 at the intermediate level. Students who wish to be eligible for entry into the Honours program must also include PSYC3010. *Note: HPSC3023 Psychology & Psychiatry: History & Phil is available as a Senior Psychology unit and will count towards a major in Psychology. Successful completion of this unit of study is essential for students intending to take the Theoretical Thesis option in Psychology Honours.			
Junior units of study			
PSYC1001 **Psychology 1001**	6		Intensive June Semester 1 Summer Main
PSYC1002 **Psychology 1002**	6	*This unit is also offered in the Sydney Summer School. For more information consult the web site: http://sydney.edu.au/summer/*	Semester 2 Summer Main
Intermediate units of study			
PSYC2010 **Brain and Behaviour**	6	**P** PSYC1002 **N** PSYC2011, PSYC2911, PSYC2910	Semester 1
PSYC2910 **Brain and Behaviour (Advanced)**	6	**P** A mark of at least 75 in PSYC1002 **N** PSYC2011, PSYC2911, PSYC2010	Semester 1
PSYC2012 **Statistics and Research Methods for Psych**	6	**A** Recommended: HSC Mathematics, any level **P** PSYC1001 OR PSYC1002	Semester 1
PSYC2013 **Cognitive and Social Psychology**	6	**P** PSYC1001 and PSYC1002	Semester 2
PSYC2014 **Personality and Psychology Assessment 1**	6	**P** PSYC1001 and PSYC1002	Semester 2
NB: PSYC2010/2910 replaced PSYC2011/2911 from 2017.			
Senior units of study			
PSYC3010 **Advanced Statistics for Psychology**	6	**P** PSYC2012 plus at least one other Intermediate Psychology Unit of Study from PSYC2010, PSYC2910, PSYC2011, PSYC2911, PSYC2013, PSYC2014	Semester 2
PSYC3011 **Learning and Behaviour**	6	**P** (PSYC2011 or PSYC2911 or PSYC2010 or PSYC2910) and PSYC2012 **N** PSYC3911	Semester 1
PSYC3911 **Learning and Behaviour (Advanced)**	6	**P** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **N** PSYC3011	Semester 1
PSYC3012 **Cognition, Language and Thought**	6	**P** PSYC2012 and PSYC2013	Semester 1
PSYC3013 **Perceptual Systems**	6	**P** (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and PSYC2012 **N** PSYC3913	Semester 2
PSYC3913 **Perceptual Systems (Advanced)**	6	**P** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **N** PSYC3013	Semester 2
PSYC3014 **Behavioural and Cognitive Neuroscience**	6	**P** [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **N** PSYC3914	Semester 2
PSYC3914 **Behavioural and Cognitive Neuroscience Adv**	6	**P** [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **N** PSYC3014	Semester 2
PSYC3015 **Personality and Psychology Assessment 2**	6	**P** PSYC2012 and PSYC2014	Semester 1
PSYC3016 **Developmental Psychology**	6	**P** PSYC2012 and PSYC2013 **N** PSYC3916	Semester 2
PSYC3916 **Developmental Psychology (Advanced)**	6	**P** (A mark of 75 or above in PSYC2013) and PSYC2012 **N** PSYC3016	Semester 2
PSYC3017 **Social Psychology**	6	**P** PSYC2013	Semester 1
PSYC3018 **Abnormal Psychology**	6	**P** (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and PSYC2014	Semester 1
PSYC3020 **Applied Psychology**	6	**P** 12 credit points of junior psychology and 12 credit points in Intermediate Psychology **N** PSYC3019	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
HPSC3023 **Psychology and Psychiatry: History and Phil**	6	**A** HPSC2100 and HPSC2101 **P** (12 credit points of Intermediate HPSC units) OR (Credit or greater in an HPSC Intermediate unit) OR (12 Intermediate credit points in Psychology units)	Semester 1

Psychology

For a major in Psychology, the minimum requirement is 48 credit points across Intermediate and Senior Psychology* units of study, including (PSYC2010/2910 or PSYC2011/2911), PSYC2012, PSYC2013, and PSYC2014. No other Intermediate Psychology units can be counted towards a major. Students must complete at least 24 credit points of Senior Psychology units for a major (or 30 credit points of Senior Psychology units for students in the BPsych degree). PSYC3018 must be included for students who have not completed PSYC2010/2910 at the intermediate level. Students who wish to be eligible for entry into the Honours program must also include PSYC3010.*Note: HPSC3023 Psychology & Psychiatry: History & Phil is available as a Senior Psychology unit and will count towards a major in Psychology. Successful completion of this unit of study is essential for students intending to take the Theoretical Thesis option in Psychology Honours.

Junior units of study

PSYC1001
Psychology 1001

Credit points: 6 **Session:** Intensive June, Semester 1, Summer Main **Classes:** Three 1 hour lectures and one 1 hour tutorial per week, plus 1 hour per week of additional web-based (self-paced) material related to the tutorial. **Assessment:** One 2.5hr exam, one 1000 word research report, multiple tutorial tests, experimental participation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Psychology 1001 is a general introduction to the main topics and methods of psychology, and is the basis for advanced work as well as being of use to those not proceeding with the subject. Psychology 1001 covers the following areas: science and statistics in psychology; applied psychology; themes in the history of psychology; social psychology; personality theory; human development. This unit is also offered in the Sydney Summer School. For more information consult the web site: http://sydney.edu.au/summer_school/

Textbooks

Available on-line once semester commences

PSYC1002
Psychology 1002

Credit points: 6 **Session:** Semester 2, Summer Main **Classes:** Three 1 hour lectures and one 1 hour tutorial per week, plus 1 hour per week of additional web-based (self-paced) material related to the tutorial. **Assessment:** One 2.5hr exam, one 1000 word research report, multiple tutorial tests, experimental participation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit is also offered in the Sydney Summer School. For more information consult the web site: http://sydney.edu.au/summer/

Psychology 1002 is a further general introduction to the main topics and methods of psychology, and it is the basis for advanced work as well as being of use to those not proceeding with the subject. Psychology 1002 covers the following areas: neuroscience; human mental abilities; learning and motivation; visual perception; cognitive processes; abnormal psychology.

This unit is also offered in the Sydney Summer School. For more information consult the web site:

http://sydney.edu.au/summer_school/

Textbooks

Available on-line once semester commences

Intermediate units of study

PSYC2010
Brain and Behaviour

Credit points: 6 **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2910 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study examines a range of phenomena and principles in behaviour, learning and perception, abnormal psychology and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes are designed for students with an interest in clinical and therapeutic Psychology, and will allow students to design and implement a behaviour modification programme.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.
Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2910
Brain and Behaviour (Advanced)

Credit points: 6 **Teacher/Coordinator:** Dr Ian Johnston **Session:** Semester 1 **Classes:** 3x1hr lectures and 1x1hr tutorial per week **Prerequisites:** A mark of at least 75 in PSYC1002 **Prohibitions:** PSYC2011, PSYC2911, PSYC2010 **Assessment:** 1x2hr examination, 1x1500 word report, 1 x quiz, 1 x oral presentation/debate (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit of Study focuses on the Behavioural Sciences, Neurosciences, Abnormal Psychology and the study of perception. The lecture content is the same as PSYC2011, and examines a range of phenomena and principles in behaviour, learning and perception, and their relations to underlying neural substrates. The emphasis in learning is on instrumental conditioning and the principle of reinforcement, ranging from applications of this principle to its neural substrates. Also covered are motivational aspects of behaviour, such as punishment and avoidance. The Abnormal Psychology section will focus on emotional and motivational disorders, such as anxiety and depression, addiction, sex and appetite, together with related neurochemical mechanisms and the effects of various psychopharmacological agents on these processes. A number of perceptual phenomena will be studied, such as motion detection, recognition of faces, identification of emotion, hearing and hearing loss, taste discrimination, and chronic pain. The practical classes differ from PSYC2011, as it is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. Students will gain hands-on laboratory experience in how the principles and phenomena of behavioural neuroscience may be studied experimentally.

Textbooks

Bouton, M.E. (2007). Learning and Behavior: A Contemporary Synthesis. Sinauer.
Wickens, A. (2009) Introduction to Biopsychology, 3rd edition. Pearson.

PSYC2012
Statistics and Research Methods for Psych

Credit points: 6 **Session:** Semester 1 **Classes:** 3 x 1 hour lectures per week for 6 weeks (even weeks) and 2 x 1 hour lectures per week for the remaining 7 weeks (odd weeks); 2 hour tutorial per week **Prerequisites:** PSYC1001 OR PSYC1002 **Assumed knowledge:** Recommended: HSC Mathematics, any level **Assessment:** One 2 hour final exam plus a combination of in class tests, midsemester exam, and/or a written assignment (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim is to introduce students to fundamental concepts in statistics as applied to psychological research. These include summary descriptive statistics, an introduction to the principles and practice of research design, and the use of inferential statistics. Building upon this framework, the unit of study aims to develop each student's expertise in understanding the rationale for, and application of, a variety of statistical tests to the sorts of data typically obtained in psychological research.

PSYC2013
Cognitive and Social Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** PSYC1001 and PSYC1002 **Assessment:** One 2 hour exam, major assignment (1500-2000 word essay/report), minor assignment (short written practical exercise and/or tutorial quiz) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit expands the depth and range of topics introduced in the first year lectures on Cognitive Processes, Social Psychology and Developmental Psychology. The section on Cognitive Processes focuses on current theories of memory, attention, and reasoning and discusses the methods and issues involved in investigating these processes in both healthy individuals and people with cognitive dysfunctions. The second section on Social Psychology examines salient social constructs such as impression management, and prejudice, and explores how mental processes affect social judgment and behaviour. The final section on Developmental Psychology presents and evaluates evidence about the early influences on children's social and cognitive development.

PSYC2014
Personality and Psychology Assessment 1

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week. **Prerequisites:** PSYC1001 and PSYC1002 **Assessment:** One 2 hour exam, major assignment (1500-2000 word essay/report), minor assignment (short written practical exercise and/or tutorial quizzes and/or class presentation) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The main aim of this course is to introduce students to a number of influential theories in personality and intelligence. Students will be exposed to some conceptual analysis and will be expected to gain an understanding and be able to examine critically the various theories covered. Furthermore, students will be introduced to key topics in the scientific study and assessment of individual differences (Psychometrics) in personality and intelligence. The course will cover both conceptual (e.g. validity and reliability) and applied (e.g. Factor Analysis) elements of statistical psychometric inference.

NB: PSYC2010/2910 replaced PSYC2011/2911 from 2017.

Senior units of study

PSYC3010
Advanced Statistics for Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** PSYC2012 plus at least one other Intermediate Psychology Unit of Study from PSYC2010, PSYC2910, PSYC2011, PSYC2911, PSYC2013, PSYC2014 **Assessment:** One 2 hour exam, class tests, practical exercises (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study expands upon students' knowledge of the general linear model and its applications in the analysis of data from psychological research. The first half focuses on multiple regression and its extensions, which are used when the primary interest is to predict or explain a particular variable based on a set of other variables. The second half of the course introduces students to contrast analysis as an extension of ANOVA, which allows for more focused analysis of data where group comparisons are the primary interest.

Textbooks

Keith, Z. T. (2006). Multiple Regression and Beyond. New York: Pearson Education, Inc.

PSYC3011
Learning and Behaviour

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** (PSYC2011 or PSYC2911 or PSYC2010 or PSYC2910) and PSYC2012 **Prohibitions:** PSYC3911 **Assessment:** One 2 hour exam, one 2000 word prac report, tutorial quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit addresses the fundamental concepts and more important research findings related to contemporary theories of associative learning in animals and humans. It examines the application of such fundamental research to issues such as drug use and food choice. It is designed to foster skills in reading primary sources in this area, and provide the opportunity for hands-on experience in carrying out a research project.

Textbooks

Bouton, M. E. (2016). Learning and Behavior: A contemporary synthesis, 2nd edition. Sunderland, MA: Sinauer.

PSYC3911
Learning and Behaviour (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** 2x 1-hr lectures and 1x 2-hr tutorial per week **Prerequisites:** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **Prohibitions:** PSYC3011 **Assessment:** One 2 hour exam, one 2500 word prac report, tutorial quizzes (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit addresses the fundamental concepts and more important research findings related to contemporary theories of associative learning in animals and humans. It examines the application of such fundamental research to issues such as drug use and food choice. It is designed to foster skills in reading primary sources in this area, and provide the opportunity for hands-on experience in carrying out a research project. In the advanced unit of study students will learn techniques to model learning and behaviour, and independently apply these skills to experimental data that they have collected.

Textbooks

Bouton, M. E. (2016). Learning and Behavior: A contemporary synthesis, 2nd edition. Sunderland, MA: Sinauer.

PSYC3012
Cognition, Language and Thought

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour practical per week. **Prerequisites:** PSYC2012 and PSYC2013 **Assessment:** One 2 hour exam, 2000 word practical report, practical exercise(s) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit extends the theories and methods of investigating memory and attentional processes discussed in PSYC2013 to consider a number of domains of higher cognitive processing. One strand of the course will focus on the cognitive processes involved in speech perception, language comprehension, language production, and reading. The remainder of the course will deal with the cognitive processes involved in reasoning and skill acquisition. The practical program will expose students to a variety of the research methods used to investigate higher cognitive processes, develop their understanding of how these methods can be used to investigate hypotheses about mental processes and consider applications of cognitive research to real-world problems and issues.

PSYC3013
Perceptual Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1-hour lectures and one 2-hour tutorial per week. **Prerequisites:** (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and PSYC2012 **Prohibitions:** PSYC3913 **Assessment:** One 2-hour exam, one 2000 word report, tutorial quiz, group presentation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Perception poses many challenges: how do we see colour and movement? How do we perceive surfaces and materials? How does combining information from multiple senses improve our perception? This unit draws on behavioural and neurophysiological perspectives to deepen understanding of current research topics in perception. The emphasis is on how visual information is processed to accomplish functions such as perceiving a single edge, extracting the contours that form a face, or the spatial relations needed to call offside on the sports field. Students also gain conceptual tools for evaluating the empirical and theoretical worth of recent research in perception. During the tutorial component of the course students will develop a practical experiment in which they formulate and test a hypothesis. In this way students gain important research experience that gives them valuable insight into the scientific process as it exists both in professional work and in the empirical research project required for the Honours degree.

Textbooks

Sensation and Perception, Third Edition

Jeremy M. Wolfe, Keith R. Kluender, Dennis M. Levi, Linda M. Bartoshuk,Rachel S. Herz, Roberta L. Klatzky, Susan J. Lederman, and Daniel M.Merfeld

PSYC3913
Perceptual Systems (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** 2x 1-hr lectures and 1x 2-hr tutorial per week **Prerequisites:** (A mark of 75 or above in PSYC2X10 or PSYC2X11) and PSYC2012 **Prohibitions:** PSYC3013 **Assessment:** One 2-hour exam, one 2000 word report, laboratory participation, group presentation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Perception poses many challenges: how do we see colour and movement? How do we perceive surfaces and materials? How does combining information from multiple senses improve our perception? This unit draws on behavioural and neurophysiological perspectives to deepen understanding of current research topics in perception. The emphasis is on how visual information is processed to accomplish functions such as perceiving a single edge, extracting the contours that form a face, or the spatial relations needed to call offside on the sports field. Students also gain conceptual tools for evaluating the empirical and theoretical worth of recent research in perception. During the tutorial component of the course students will develop a practical experiment in which they formulate and test a hypothesis. In this way students gain important research experience that gives them valuable insight into the scientific process as it exists both in professional work and in the empirical research project required for the Honours degree. In the advanced unit of study students will be placed in laboratories and will learn research techniques while helping conduct experiments in these laboratories.

Textbooks

Sensation and Perception, Third Edition

PSYC3014
Behavioural and Cognitive Neuroscience

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour practical per week. **Prerequisites:** [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [(PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **Prohibitions:** PSYC3914 **Assessment:** One 2 hour exam, one major essay/report 2000-2500 words, tutorial quizzes and participation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on approaches to studying neurosciences incorporating molecular, pre-clinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. The implications of focal cognitive deficits in neurological patients for models of normal cognitive function will also be explored. Specific topics to be covered will be selected from the following areas: sensorimotor integration and the neural and molecular basis of learning and memory, attention, language, visual cognition and praxis. In addition to lectures, a practical component will cover basic neuroanatomy and neuroscientific methods. The practical component will also introduce students to experimental and neuropsychological approaches to studying the relationahip between brain and behaviour.

PSYC3914
Behavioural and Cognitive Neuroscience Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Two lectures, one 1 hour tutorial and one 2 hour practical per week. **Prerequisites:** [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and 6 credit points from (PSYC2012 or PSYC2013 or PSYC2014)] OR [An average mark of 75 in (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911 or PSYC2013) and (ANAT2010 or ANAT2910) and PCOL2011] **Prohibitions:** PSYC3014 **Assessment:** One 2 hour exam (end of semester), one quiz (mid-semester), one presentation, one written assignment (lab report), attendance and participation in tutorial/practical exercises (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study will focus on approaches to studying neurosciences incorporating molecular, pre-clinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. Specific topics to be covered will be selected from the following areas: sensorimotor integration, and the neural and molecular basis of learning and memory, attention, language, visual cognition and praxis. The lecture material will be the same as for PSYC3014, however, the practical class is targeted for those who would like to learn more about the experimental study of behaviour and the neurosciences. The practical component of the advanced stream will cover basic neuroanatomy, histology and neuropharmacology and will introduce students to experimental approaches to studying brain-behaviour relationships.

PSYC3015
Personality and Psychology Assessment 2

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** PSYC2012 and PSYC2014 **Assessment:** One 2 hour exam; one 2000-2500 word major essay/report, and in-class activities (e.g., tutorial presentations, in-class quizzes) (100%). **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study addresses current issues in personality, psychological testing, intelligence, and individual differences. Students are introduced to different theoretical models used in personality, intelligence, emotional intelligence, and metacognition and expected to critically evaluate these theories based on the supporting research evidence. This unit also presents different psychological testing techniques and methods.

PSYC3016
Developmental Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** PSYC2012 and PSYC2013 **Prohibitions:** PSYC3916 **Assessment:** One 2 hour exam, 2000 word prac report, practical exercise(s) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines our understanding of human psychological development, focusing on selected issues and empirical traditions within the discipline of Developmental Psychology. Students are expected to gain an understanding of the theoretical influences that have come to dominate developmental research, and students will also be introduced to a range of theoretical and research approaches in contemporary Developmental Science. These include: sense of identity, conceptual development, children's thinking, social cognition, moral reasoning and behaviour, and the role of genetic and environmental influences on development. The course will also consider applications of developmental research and theory in developmental psychopathology and in educational contexts, as well as exploring children's experience of art, literature and drama. Students are expected to gain knowledge of, and develop a critical approach to, the analysis of current research and theoretical issues in these areas.

PSYC3916
Developmental Psychology (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** 2x 1-hr lectures and 1x 2-hr tutorial per week **Prerequisites:** (A mark of 75 or above in PSYC2013) and PSYC2012 **Prohibitions:** PSYC3016 **Assessment:** one 2 hour exam, 2000 word prac report, practical exercise(s) (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines our understanding of human psychological development, focusing on selected issues and empirical traditions within the discipline of Developmental Psychology. Students are expected to gain an understanding of the theoretical influences that have come to dominate developmental research, and students will also be introduced to a range of theoretical and research approaches in contemporary Developmental Science. These include: sense of identity and self-worth, conceptual development, children's thinking, social cognition, moral reasoning and behaviour, and the role of genetic and environmental influences on development. The course will also consider applications of developmental research and theory in developmental psychopathology and in educational contexts, as well as exploring children's experience of art, literature and drama. Students are expected to gain knowledge of, and develop a critical approach to, the analysis of current research and theoretical issues in these areas. In the advanced unit of study students will collect, score, and analyse the data from children participating in research projects in the School's Developmental Laboratories.

PSYC3017
Social Psychology

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1-hour lectures and one 2-hour tutorial per most weeks. **Prerequisites:** PSYC2013 **Assessment:** One 2-hour exam, one 2500 word research report (consisting of both group work and individually-written components), and tutorial presentation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit continues the coverage of topics in Social Psychology begun in PSYC1001 and PSYC2013. The unit is divided into topic areas, where the emphasis is on evaluating theories and the relevant evidence. Topics areas include among others: antisocial behaviours, discrimination, the self, emotion, cultural psychology, evolutionary psychology, and existential social psychology. Tutorials provide first-hand experience of research by involving students in a small group research project based on topics covered in the lectures. The tutorials also provide an opportunity to discuss issues pertaining to each step of the research process (e.g., ethical issues that underlie social psychological research, proper practice when collecting and handling data, how to communicate research findings in written and verbal form).

PSYC3018
Abnormal Psychology

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** (PSYC2010 or PSYC2910 or PSYC2011 or PSYC2911) and PSYC2014 **Assessment:** One 2 hour exam, one 2000 word essay, quiz, and tutorial presentation (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study critically examines core issues in abnormal psychology, concerning the description, explanation and treatment of psychological disorders. The unit of study will include topics such as:

(a) Adult abnormal psychology: Anxiety and related disorders (specific phobias, panic disorder, generalised anxiety disorder, OCD, PTSD); Substance-related and Addictive disorders (drug, alcohol, gambling); Eating disorders (anorexia nervosa, bulimia nervosa); Depressive disorders, Bipolar disorders; Schizophrenia, Personality disorders.

(b) Child abnormal psychology: Attention Deficit Hyperactivity Disorder; Conduct disorder; Anxiety disorders, Depression.

Textbooks

Rieger, E. (Ed.) (2014) Abnormal Psychology: Leading researcher perspectives. Sydney: McGraw-Hill Education. (3rd Ed).

PSYC3020
Applied Psychology

Credit points: 6 **Session:** Semester 2 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week **Prerequisites:** 12 credit points of junior psychology and 12 credit points in Intermediate Psychology **Prohibitions:** PSYC3019 **Assessment:** One 2 hour examination (50%), one 2500 word written assignment (30%), class quizzes (20%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this unit is to introduce students to various ways in which psychological theory and research can be applied in the real world. In particular, this unit will focus on Health Psychology, Forensic Psychology, and Organisational Psychology. The Health Psychology component of this course may include investigation into why we engage in risky health behaviours including smoking, overeating and alcohol use; inequalities in health including Aboriginal and Torres Strait Island health; dealing with chronic illness including death and dying, and survivorship. The Forensic Psychology component of the course may include investigation into lie detection, criminal offenders, victims of crime, and eyewitness memory. The Organisational Psychology component of the course may focus on personnel selection, training in organisations, performance measurement, workplace motivation, leadership and aspects of positive psychology.

HPSC3023
Psychology and Psychiatry: History and Phil

Credit points: 6 **Teacher/Coordinator:** A/Prof Hans Pols and Dr Fiona Hibberd **Session:** Semester 1 **Classes:** Two 1 hour lectures and one 2 hour tutorial per week. **Prerequisites:** (12 credit points of Intermediate HPSC units) OR (Credit or greater in an HPSC Intermediate unit) OR (12 Intermediate credit points in Psychology units) **Assumed knowledge:** HPSC2100 and HPSC2101 **Assessment:** 1x 2500wd essay (45%) and 1x2hr exam (45%) class participation (10%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Across the unit we examine one of the most interesting aspects of the history and philosophy of science. viz., the scientific practices and assumptions involved in making human beings an object of study. We will examine the ways in which psychologists and psychiatrists have investigated human nature, the kinds of experimental approaches they have developed to that end, the major controversies in this field, and the basic philosophical assumptions that have been made in the sciences of human nature. We investigate the developments of psychological theories and investigative methods as well as the development of psychiatric theory, treatment methods, and institutions.

Table 1: Soil Science

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Soil Science			
A major in Soil Science requires completion of SOIL3009, SOIL3010, ENVX3001, and LWSC3007.			
Intermediate units of study			
SOIL2004 **The Soil Resource**	6		Semester 2
SOIL2005 **Soil and Water: Earth's Life Support Systems**	6	**N** SOIL2003 or LWSC2002	Semester 1
Senior core units of study			
Students must complete both SOIL3009 and SOIL3010.			
SOIL3009 **Contemporary Field and Lab Soil Science**	6	**P** SOIL2003	Semester 1
SOIL3010 **The Soil at Work**	6	**P** SOIL2003 or SOIL2004	Semester 2
Senior elective units of study			
Students must complete ENVX3001 and LWSC3007.			
ENVX3001 **Environmental GIS**	6	**P** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX	Semester 2
LWSC3007 **Advanced Hydrology and Modelling**	6	**P** LWSC2002	Semester 1

Soil Science

A major in Soil Science requires completion of SOIL3009, SOIL3010, ENVX3001, and LWSC3007.

Intermediate units of study

SOIL2004
The Soil Resource

Credit points: 6 **Teacher/Coordinator:** A/Prof Stephen Cattle **Session:** Semester 2 **Classes:** (2x1 hr lec, 1x2 hr pracs)/wk, 25 hr (5 days) fieldtrip in the week immediately preceding the start of Semester 2 (Week O) **Assessment:** Fieldtrip participation (5%), soil survey mapping report (35%), laboratory report and poster presentation (20%), group tutorials (15%), viva voce exam (25%) **Practical field work:** Computer and laboratory practical sessions; 5-day fieldtrip **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will familiarise students with the description and mapping of soil types in the Australian landscape, with common analytical methods for soil and with the various forms of degradation that may alter the quality and function of soil. It is an applied soil science unit that builds on the fundamental soil science concepts learned in the SOIL2003 unit. The first practical component of the unit, a five-day soil survey, will give students experience in soil description and classification in the field, and soil samples collected during this survey will be subsequently analysed for a variety of attributes by the students in laboratory practicals. In the lecture series, topics including soil type distribution, soil quality, soil function, soil fertility and soil degradation will be discussed and linked to practical sessions. By the end of this unit, students will be able to construct maps of soil properties and soil type distribution, describe primary soil functions, soil attributes and types of soil degradation in an agricultural context, and be able to recognize and communicate the ability of a soil profile to sustain plant growth. Students will gain research and inquiry skills by collecting, analysing and interpreting soil survey data, and will gain communication skills by having to prepare and present a poster.

SOIL2005
Soil and Water: Earth's Life Support Systems

Credit points: 6 **Teacher/Coordinator:** Prof Balwant Singh **Session:** Semester 1 **Classes:** Lectures: 3 hours per week; lab: 3 hours per week for 10 weeks **Prohibitions:** SOIL2003 or LWSC2002 **Assessment:** Field excursion: attendance and creative assessment (5%), the attendance at the excursion is complusory to get any mark for this assessment task; quiz: (10%); written assignment: modelling assessment including modelling (15%); laboratory report: group oral presentation and written assignment (20%); final exam: final written exam (50%) **Practical field work:** Approximately eight hours working field at Cobbitty Farm Wk 0 (Friday, 2 March 2018) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Soil and water are the two most essential natural resources on the Earth's surface which influence all forms of terrestrial life. This unit of study is designed to introduce students to the fundamental properties and processes of soil and water that affect food security and sustain ecosystems. These properties and processes are part of the grounding principles that underpin crop and animal production, nutrient and water cycling, and environmental sustainability. You will participate in a field excursion to examine soils in a landscape to develop knowledge and understanding of soil properties, water storage, water movement and cycling of organic carbon and nutrients in relation to food production and ecosystem functioning. At the end of this unit you will be able to articulate and quantify the factors and processes that determine the composition and behaviour of soil, composition of water, soil water storage and the movement of water on the land surface. You will also be able to describe the most important properties of soil and water for food production and sustaining ecosystem functions and link this to human and climatic factors. The field excursion, report and laboratory/computer exercises have been designed to develop communication, team work and collaborative efforts.

Textbooks

Brady, N.C. and Ray R. Weil. (2007). The Nature and Properties of Soils. 14th Edition, Prentice Hall, New Jersey. White, R.E. (2006) Principles and Practice of Soil Science: the Soil as a Natural Resource. 4th ed., Blackwell Science, Oxford. Diana H. Wall, Richard D. Bardgett, Valerie Behan-Pelletier, Jeffrey E. Herrick, T. Hefin Jones, Karl Ritz, Johan Six, Donald R. Strong, and Wim H.

van der Putten (Eds.) (2012). Soil Ecology and Ecosystem Services. Oxford University Press, ISBN: 9780199575923. Kutllek, M and Nielsen, D.R. (2015). Soil: The Skin of the Planet Earth, Springer, ISBN: 978-94-017-9788-7 (Print) 978-94-017-9789-4 (Online). Gordon, N. D., McMahon, T. A., Finlayson, B. L., Gippel, C. J., and Nathan, R. J. (2004) Stream Hydrology: an Introduction for Ecologists, John Wiley and Sons Inc.

Senior core units of study

Students must complete both SOIL3009 and SOIL3010.

SOIL3009
Contemporary Field and Lab Soil Science

Credit points: 6 **Teacher/Coordinator:** Prof Budiman Minasny (Coordinator), Prof Balwant Singh, A/Prof. Stephen Cattle, Prof Alex McBratney, A/Prof Damien Field **Session:** Semester 1 **Classes:** Two lectures and two practicals, or one lecture and three practicals per week, 6-day field excursion north-western NSW commencing 15 days prior to beginning of Semester 1 **Prerequisites:** SOIL2003 **Assessment:** One viva voce exam (40%), soil physics written assessments (20%), soil chemistry written assessments (20%), soil judging (12%), pedology written assessments (8%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a theoretical and empirical unit providing specialised training in three important areas of contemporary soil science, namely pedology, soil chemistry and soil physics. The key concepts of these sub-disciplines will be outlined and strengthened by hands-on training in essential field and laboratory techniques. All of this is synthesized by placing it in the context of soil distribution and use in North-Western New South Wales. The unit is motivated by the teaching team's research in this locale. It builds on students, existing soil science knowledge gained in SOIL2003. After completion of the unit, students should be able to articulate the advantages and disadvantages of current field and laboratory techniques for gathering necessary soil information, and simultaneously recognise key concepts and principles that guide contemporary thought in soil science. Students will be able to synthesise soil information from a multiplicity of sources and have an appreciation of the cutting edge areas of soil management and research. By investigating the contemporary nature of key concepts, students will develop their skills in research and inquiry. Students will develop their communication skills through report writing and will also articulate an openness to new ways of thinking which augments intellectual autonomy. Teamwork and collaborative efforts are encouraged in this unit.

Textbooks

Textbooks: D. Hillel. 2004. Introduction to Environmental Soil Physics. Elsevier Science, San Diego, CA, USA, R. Schaetzl and S. Anderson 2005. Soils: Genesis and Geomorphology. Cambridge University Press, New York, NY, USA, D.L. Sparks 2003 Environmental Soil Chemistry (2nd edn). Academic Press, San Diego, CA, USA

SOIL3010
The Soil at Work

Credit points: 6 **Teacher/Coordinator:** Prof Budiman Minasny (Coordinator), Prof Balwant Singh, Prof Alex McBratney, A/Prof. Stephen Cattle, A/Prof Damien Field **Session:** Semester 2 **Classes:** Problem-based unit: each student completes one problem as part of a team, involving multiple team meetings **Prerequisites:** SOIL2003 or SOIL2004 **Assessment:** Introduction to the problem group presentation (10%); status of the problem group report (10%); how to tackle the problem seminar (20%) - team seminars, before fieldwork, analyses done; results seminar (20%) - team seminars; final group report (25%); activities diary for group (15%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a problem-based applied soil science unit addressing the physical, chemical and biological components of soil function. It is designed to allow students to identify soil-related problems in the real-world and by working in a group and with an end-user, to suggest short and long-term solutions to problems such as fertility, resilience, carbon management, structural decline, acidification, salinisation and contamination. By designing and administering strategies to tackle real-world soil issues, students will develop their research and inquiry skills and enhance their intellectual autonomy. By producing reports and seminars that enables understanding by an end-user, students will improve the breadth of their communication skills. This is a core unit for students majoring or specialising in soil science and an elective unit for those wishing to gain an understanding of environmental problem-solving. It utilises and reinforces soil-science knowledge gained in SOIL2003 and SOIL2004, as well as generic problem-solving skills gained during the degree program.

Textbooks

Reference book: I.W.Heathcote 1997. Environmental Problem Solving: A Case Study Approach. McGraw-Hill, New York, NY, USA.

Senior elective units of study

Students must complete ENVX3001 and LWSC3007.

ENVX3001
Environmental GIS

Credit points: 6 **Teacher/Coordinator:** A/Prof Inakwu Odeh **Session:** Semester 2 **Classes:** Three-day field trip, (two lectures and two practicals per week) **Prerequisites:** 6cp from (ENVI1003, AGEN1002) or 6cp from GEOS1XXX or 6cp from BIOL1XXX **Assessment:** One 15-minute presentation (10%), 3500wd prac report (35%), 1500wd report on trip excursion (15%), 2-hour exam (40%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is designed to impart knowledge and skills in spatial analysis and geographical information science (GISc) for decision-making in an environmental context. The lecture material will present several themes: principles of GISc, geospatial data sources and acquisition methods, processing of geospatial data and spatial statistics. Practical exercises will focus on learning geographical information systems (GIS) and how to apply them to land resource assessment, including digital terrain modelling, land-cover assessment, sub-catchment modelling, ecological applications, and soil quality assessment for decisions regarding sustainable land use and management. A three day field excursion during the mid-semester break will involve a day of GPS fieldwork at Arthursleigh University farm and two days in Canberra visiting various government agencies which research and maintain GIS coverages for Australia. By the end of this UoS, students should be able to: differentiate between spatial data and spatial information; source geospatial data from government and private agencies; apply conceptual models of spatial phenomena for practical decision-making in an environmental context; apply critical analysis of situations to apply the concepts of spatial analysis to solving environmental and land resource problems; communicate effectively results of GIS investigations through various means- oral, written and essay formats; and use a major GIS software package such as ArcGIS.

Textbooks

Burrough, P.A. and McDonnell, R.A. 1998. Principles of Geographic Information Systems. Oxford University Press: Oxford.
Clarke, K. C. 2003. Getting Started With Geographic Information Systems. 4th Edition. Prentice Hall: Upper Saddle River, New Jersey.

LWSC3007
Advanced Hydrology and Modelling

Credit points: 6 **Teacher/Coordinator:** A/Prof Willem Vervoort (Coordinator), Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** 2-hour lecture per week, 3-hour practical per week **Prerequisites:** LWSC2002 **Assessment:** Four practical assessments and reports (50%), take-home exam (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed to allow students to examine advanced hydrological modeling focusing on catchment level responses and uncertainty. Students will learn how to develop their own simulation model of catchment hydrological processes in R and using SWAT and review the possibilities and impossibilities of using simulation models for catchment management. Students will further investigate landuse change impacts and climate change impacts the variability in hydrological responses. At the end of this unit, students will be able to calibrate and evaluate a catchment model, articulate advantages and disadvantages of using simulation models for catchment management, justify the choice of a simulation model for a particular catchment management problem, identify issues in relation to uncertainty in water quality and quantity The students will gain research and inquiry skills through research based assignments, information literacy and communication skills through laboratory reports and a presentation and personal and intellectual autonomy through working in groups.

Textbooks

Textbooks (Recommended reading)

Beven, K.J. Rainfall-Runoff modeling, The Primer, John Wiley and Sons, Chichester, 2001

Table 1: Statistics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Statistics			
For a major in Statistics, the minimum requirement is 24 credit points from senior units of study listed below.			
Junior units of study			
DATA1001 **Foundations of Data Science**	6	**N** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021	Semester 1 Semester 2
Intermediate units of study			
DATA2002 **Data Analytics: Learning from Data**	6	**A** (Basic Linear Algebra and some coding) or QBUS1040 **P** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **N** STAT2012 or STAT2912	Semester 2
STAT2011 **Probability and Estimation Theory**	6	**P** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **N** STAT2901 or STAT2001 or STAT2911	Semester 1
STAT2911 **Probability and Statistical Models (Adv)**	6	**P** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **N** STAT2001 or STAT2901 or STAT2011	Semester 1
STAT2912 **Statistical Tests (Advanced)**	6	**A** STAT2911 **P** MATH1905 or Credit in MATH1005 or Credit in ECMT1010 or Credit in BUSS1020 **N** STAT2012 or STAT2004 or DATA2002	Semester 2
Senior units of study			
STAT3011 **Stochastic Processes and Time Series**	6	**P** STAT2X11 and (MATH1X03 or MATH1907 or MATH1X23 or MATH1933). **N** STAT3911 or STAT3903 or STAT3003 or STAT3905 or STAT3005	Semester 1
STAT3911 **Stochastic Processes and Time Series Adv**	6	**P** (STAT2911 or a mark of 65 or above in STAT2011) and (MATH1X03 or MATH1907 or MATH1X23 or MATH1933) **N** STAT3011 or STAT3905 or STAT3005 or STAT3003 or STAT3903	Semester 1
STAT3012 **Applied Linear Models**	6	**P** (DATA2002 or STAT2X12) and (MATH1X02 or MATH1014) **N** STAT3002 or STAT3004 or STAT3902 or STAT3912 or STAT3904	Semester 1
STAT3912 **Applied Linear Models (Advanced)**	6	**P** [STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002)] and (MATH2X61 or MATH1902 or MATH2X22) **N** STAT3012 or STAT3002 or STAT3902 or STAT3004 or STAT3904	Semester 1
STAT3013 **Statistical Inference**	6	**P** STAT2X11 and (DATA2002 or STAT2X12) **N** STAT3913 or STAT3001 or STAT3901	Semester 2
STAT3913 **Statistical Inference Advanced**	6	**P** STAT2911 and (DATA2002 or STAT2X12) **N** STAT3013 or STAT3901 or STAT3001	Semester 2
STAT3014 **Applied Statistics**	6	**A** STAT3012 or STAT3912 **P** DATA2002 or STAT2X12 **N** STAT3914 or STAT3002 or STAT3902 or STAT3006	Semester 2
STAT3914 **Applied Statistics Advanced**	6	**A** STAT3912 **P** STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002) **N** STAT3014 or STAT3907 or STAT3902 or STAT3006 or STAT3002	Semester 2
ENVX3002 **Statistics in the Natural Sciences**	6	**P** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 *Interdisciplinary Unit*	Semester 1

Statistics

For a major in Statistics, the minimum requirement is 24 credit points from senior units of study listed below.

Junior units of study

DATA1001
Foundations of Data Science

Credit points: 6 **Teacher/Coordinator:** Dr Di Warren **Session:** Semester 1, Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prohibitions:** MATH1005 or MATH1905 or MATH1015 or MATH1115 or ENVX1001 or ENVX1002 or ECMT1010 or BUSS1020 or STAT1021 **Assessment:** assignments, quizzes, presentation, exam **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

DATA1001 is a foundational unit in the Data Science major. The unit focuses on developing critical and statistical thinking skills for all students. Does mobile phone usage increase the incidence of brain tumours? What is the public's attitude to shark baiting following a fatal attack? Statistics is the science of decision making, essential in every industry and undergirds all research which relies on data. Students will use problems and data from the physical, health, life and social sciences to develop adaptive problem solving skills in a team setting. Taught interactively with embedded technology, DATA1001 develops critical thinking and skills to problem-solve with data. It is the prerequisite for DATA2002.

Textbooks

Statistics, Fourth Edition, Freedman Pisani Purves

Intermediate units of study

DATA2002
Data Analytics: Learning from Data

Credit points: 6 **Teacher/Coordinator:** Jean Yang **Session:** Semester 2 **Classes:** lecture 3 hrs/week; computer tutorial 2 hr/week **Prerequisites:** [DATA1001 or ENVX1001 or ENVX1002] or [MATH10X5 and MATH1115] or [MATH10X5 and STAT2011] or [MATH1905 and MATH1XXX (except MATH1XX5)] or [BUSS1020 or ECMT1010 or STAT1021] **Prohibitions:** STAT2012 or STAT2912 **Assumed knowledge:** (Basic Linear Algebra and some coding) or QBUS1040 **Assessment:** written assignment, presentation, exams **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Technological advances in science, business, engineering has given rise to a proliferation of data from all aspects of our life. Understanding the information presented in these data is critical as it enables informed decision making into many areas including market intelligence and science. DATA2002 is an intermediate course in statistics and data sciences, focusing on learning data analytic skills for a wide range of problems and data. How should the Australian government measure and report employment and unemployment? Can we tell the difference between decaffeinated and regular coffee ? In this course, you will learn how to ingest, combine and summarise data from a variety of data models which are typically encountered in data science projects as well as reinforcing their programming skills through experience with statistical programming language. You will also be exposed to the concept of statistical machine learning and develop the skill to analyze various types of data in order to answer a scientific question. From this unit, you will develop knowledge and skills that will enable you to embrace data analytic challenges stemming from everyday problems.

STAT2011
Probability and Estimation Theory

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory week. **Prerequisites:** (MATH1X21 or MATH1931 or MATH1X01 or MATH1906 or MATH1011) and (MATH1XX5 or STAT1021 or ECMT1010 or BUSS1020) **Prohibitions:** STAT2901 or STAT2001 or STAT2911 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an introduction to univariate techniques in data analysis and the most common statistical distributions that are used to model patterns of variability. Common discrete random models like the binomial, Poisson and geometric, continuous models including the normal and exponential will be studied along with elementary regression models. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2911
Probability and Statistical Models (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [MATH19X3 or MATH1907 or (a mark of 65 in MATH1023 or MATH1003)] and [MATH1905 or MATH1904 or (a mark of 65 in MATH1005 or ECMT1010 or BUSS1020)] **Prohibitions:** STAT2001 or STAT2901 or STAT2011 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an advanced version of STAT2011, with an emphasis on the mathematical techniques used to manipulate random variables and probability models. Common distributions including the Poisson, normal, beta and gamma families as well as the bivariate normal are introduced. Moment generating functions and convolution methods are used to understand the behaviour of sums of random variables. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The notions of conditional expectation and prediction will be covered as will be distributions related to the normal: chi^2, t and F. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2912
Statistical Tests (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** MATH1905 or Credit in MATH1005 or Credit in ECMT1010 or Credit in BUSS1020 **Prohibitions:** STAT2012 or STAT2004 or DATA2002 **Assumed knowledge:** STAT2911 **Assessment:** One 2-hour exam, assignments and/or quizzes, computer practical reports and one computer practical exam (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an advanced version of STAT2012 with an emphasis on both methods and the mathematical derivation of these methods: Tests of hypotheses and confidence intervals, including t-tests, analysis of variance, regression - least squares and robust methods, power of tests, non-parametric methods, non-parametric smoothing, tests for count data, goodness of fit, contingency tables. Graphical methods and diagnostic methods are used throughout with all analyses discussed in the context of computation with real data using an interactive statistical package.

Senior units of study

STAT3011
Stochastic Processes and Time Series

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures and one 1 hour tutorial per week; ten 1 hour computer laboratories per semester. **Prerequisites:** STAT2X11 and (MATH1X03 or MATH1907 or MATH1X23 or MATH1933). **Prohibitions:** STAT3911 or STAT3903 or STAT3003 or STAT3905 or STAT3005 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Section I of this course will introduce the fundamental concepts of applied stochastic processes and Markov chains used in financial mathematics, mathematical statistics, applied mathematics and physics. Section II of the course establishes some methods of modeling and analysing situations which depend on time. Fitting ARMA models for certain time series are considered from both theoretical and practical points of view. Throughout the course we will use the S-PLUS (or R) statistical packages to give analyses and graphical displays.

STAT3911
Stochastic Processes and Time Series Adv

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lecture, one 1 hour tutorial per week, plus an extra 1 hour lecture per week on advanced material in the first half of the semester. Seven 1 hour computer laboratories (on time series) in the second half of the semester (one 1 hour class per week). **Prerequisites:** (STAT2911 or a mark of 65 or above in STAT2011) and (MATH1X03 or MATH1907 or MATH1X23 or MATH1933) **Prohibitions:** STAT3011 or STAT3905 or STAT3005 or STAT3003 or STAT3903 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is an Advanced version of STAT3011. There will be 3 lectures in common with STAT3011. In addition to STAT3011 material, theory on branching processes and Brownian bridges will be covered.

STAT3012
Applied Linear Models

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratories per week. **Prerequisites:** (DATA2002 or STAT2X12) and (MATH1X02 or MATH1014) **Prohibitions:** STAT3002 or STAT3004 or STAT3902 or STAT3912 or STAT3904 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course will introduce the fundamental concepts of analysis of data from both observational studies and experimental designs using classical linear methods, together with concepts of collection of data and design of experiments. First we will consider linear models and regression methods with diagnostics for checking appropriateness of models. We will look briefly at robust regression methods here. Then we will consider the design and analysis of experiments considering notions of replication, randomization and ideas of factorial designs. Throughout the course we will use the R statistical package to give analyses and graphical displays.

STAT3912
Applied Linear Models (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** [STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002)] and (MATH2X61 or MATH1902 or MATH2X22) **Prohibitions:** STAT3012 or STAT3002 or STAT3902 or STAT3004 or STAT3904 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is essentially an Advanced version of STAT3012, with emphasis on the mathematical techniques underlying applied linear models together with proofs of distribution theory based on vector space methods. There will be 3 lectures per week in common with STAT3012 and some advanced material given in a separate advanced tutorial together with more advanced assessment work.

STAT3013
Statistical Inference

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** STAT2X11 and (DATA2002 or STAT2X12) **Prohibitions:** STAT3913 or STAT3001 or STAT3901 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

In this course we will study basic topics in modern statistical inference. This will include traditional concepts of mathematical statistics: likelihood estimation, method of moments, properties of estimators, exponential families, decision-theory approach to hypothesis testing, likelihood ratio test as well as more recent approaches such as Bayes estimation, Empirical Bayes and nonparametric estimation. During the computer classes (using R software package) we will illustrate the various estimation techniques and give an introduction to computationally intensive methods like Monte Carlo, Gibbs sampling and EM-algorithm.

STAT3913
Statistical Inference Advanced

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** STAT2911 and (DATA2002 or STAT2X12) **Prohibitions:** STAT3013 or STAT3901 or STAT3001 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an Advanced version of STAT3013, with emphasis on the mathematical techniques underlying statistical inference together with proofs based on distribution theory. There will be 3 lectures per week in common with some material required only in this advanced course and some advanced material given in a separate advanced tutorial together with more advanced assessment work.

STAT3014
Applied Statistics

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures, one 1 hour tutorial and one 1 hour computer laboratory per week. **Prerequisites:** DATA2002 or STAT2X12 **Prohibitions:** STAT3914 or STAT3002 or STAT3902 or STAT3006 **Assumed knowledge:** STAT3012 or STAT3912 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit has three distinct but related components: Multivariate analysis; sampling and surveys; and generalised linear models. The first component deals with multivariate data covering simple data reduction techniques like principal components analysis and core multivariate tests including Hotelling's T^2, Mahalanobis' distance and Multivariate Analysis of Variance (MANOVA). The sampling section includes sampling without replacement, stratified sampling, ratio estimation, and cluster sampling. The final section looks at the analysis of categorical data via generalized linear models. Logistic regression and log-linear models will be looked at in some detail along with special techniques for analyzing discrete data with special structure.

STAT3914
Applied Statistics Advanced

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1 hour lectures and one 1 hour computer laboratory per week plus an extra hour each week which will alternate between lectures and tutorials. **Prerequisites:** STAT2912 or (a mark of 65 or above in STAT2012 or DATA2002) **Prohibitions:** STAT3014 or STAT3907 or STAT3902 or STAT3006 or STAT3002 **Assumed knowledge:** STAT3912 **Assessment:** One 2 hour exam, assignments and/or quizzes, and computer practical reports (100%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit is an Advanced version of STAT3014. There will be 3 lectures per week in common with STAT3014. The unit will have extra lectures focusing on multivariate distribution theory developing results for the multivariate normal, partial correlation, the Wishart distribution and Hotelling's T^2. There will also be more advanced tutorial and assessment work associated with this unit.

ENVX3002
Statistics in the Natural Sciences

Credit points: 6 **Teacher/Coordinator:** Dr Floris Van Ogtrop **Session:** Semester 1 **Classes:** one 2-hour workshop per week, one 3-hour computer practical per week **Prerequisites:** ENVX2001 or BIOM2001 or STAT2X12 or BIOL2X22 or DATA2002 or QBIO2001 **Assessment:** One exam during the exam period (50%), five assessment tasks (50%) **Campus:** Camperdown/Darlington, Sydney **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Interdisciplinary Unit

This unit of study is designed to introduce students to the analysis of data they may face in their future careers, in particular data that are not well behaved. The data may be non-normal, there may be missing observations, they may be correlated in space and time or too numerous to analyse with standard models. The unit is presented in an applied context with an emphasis on correctly analysing authentic datasets, and interpreting the ouput. It begins with the analysis and design experiments based on the general linear model. In the second part, students will learn about the generalisation of the general linear model to accommodate non-normal data with a particular emphasis on the binomial and poisson distributions. In the third part linear mixed models will be introduced which provide the means to analyse datasets that do not meet the assumptions of independent and equal errors, for example data that is correlated in space and time. The units ends with an introduction to machine learning and predictive modelling. A key feature of the unit is using R to develop coding skills that are become essential in science for processing and analysing datasets of ever increasing size.

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