THE UNIVERSITY OF SYDNEY

FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGIES

HANDBOOK 2011

Handbooks online: **sydney.edu.au/handbooks**

Acknowledgements

The Arms of the University

Sidere mens eadem mutato

Though the constellations change, the mind is universal

Official course information

Faculty handbooks and their respective online updates, along with the *University of Sydney Calendar*, form the official legal source of information relating to study at the University of Sydney. Please refer to the following websites:

sydney.edu.au/handbooks
sydney.edu.au/calendar

Amendments

All authorised amendments to this handbook can be found at sydney.edu.au/handbooks/handbooks_admin/updates2011

Resolutions

The Coursework Clause

Resolutions must be read in conjunction with the *University of Sydney (Coursework) Rule 2000 (as amended)*, which sets out the requirements for all undergraduate courses, and the relevant resolutions of the Senate.

The Research Clause

All postgraduate research courses must be read in conjunction with the relevant rules and resolutions of the Senate and Academic Board, including but not limited to:

1. The *University of Sydney (Amendment Act) Rule 1999 (as amended)*.
2. The *University of Sydney (Doctor of Philosophy (PhD)) Rule 2004*.
3. The resolutions of the Academic Board relating to the Examination Procedure for the Degree of Doctor of Philosophy.
4. The relevant faculty resolutions.

Disclaimers

1. The material in this handbook may contain references to persons who are deceased.
2. The information in this handbook was as accurate as possible at the time of printing. The University reserves the right to make changes to the information in this handbook, including prerequisites for units of study, as appropriate. Students should check with faculties for current, detailed information regarding units of study.

Price

The price of this handbook can be found on the back cover and is in Australian dollars. The price includes GST.

Handbook availability

Handbooks are available as a website, PDF download and print on demand. See the handbooks website at sydney.edu.au/handbooks for more information.

Production

Web and Print Production Website: sydney.edu.au/web_print

Printing

SOS Print and Media

Handbook enquiries

For any enquiries relating to the handbook, please email the handbook editors at wpp.info@sydney.edu.au

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Important dates

University semester and vacation dates for 2011

Summer/Winter School lectures	**Dates**
Summer School - December program	Begins: Monday 6 December 2010
Summer School - main program	Begins: Tuesday 4 January 2011
Summer School - late January program	Begins: Monday 17 January
Winter School - main program	Begins: Monday 27 June
Semester One	**Dates**
International student orientation (Semester One) - STABEX	Monday 14 February and Tuesday 15 February
International student orientation (Semester One) - full degree	Wednesday 16 February and Thursday 18 February
Lectures begin	Monday 28 February
AVCC Common Week/non-teaching Easter period	Friday 22 April to Friday 29 April
International application deadline (Semester Two) *	Thursday 29 April *
Last day of lectures	Friday 3 June
Study vacation	Monday 6 June to Friday 10 June
Examination period	Tuesday 14 June to Saturday 25 June
Semester ends	Saturday 25 June
AVCC Common Week/non-teaching period	Monday 4 July to Friday 8 July
Semester Two	**Dates**
International student orientation (Semester Two) - STABEX	Monday 18 July and Tuesday 19 July
International student orientation (Semester Two) - full degree	Wednesday 21 July and Thursday 22 July
Lectures begin	Monday 25 July
AVCC Common Week/non-teaching period	Monday 26 September to Friday 30 September
Last day of lectures	Friday 28 October
International application deadline (for Semester One, 2011) *	Saturday 29 October *
Study vacation	Monday 31 October to Friday 4 November
Examination period	Monday 7 November to Saturday 19 November
Semester ends	Saturday 19 November

* Except for the faculties of Dentistry, Medicine and the Master of Pharmacy course. See www.acer.edu.au for details.

Last dates for withdrawal or discontinuation for 2011

Semester One- units of study	**Dates**
Last day to add a unit	Friday 11 March
Last day for withdrawal	Thursday 31 March
Last day to discontinue without failure (DNF)	Friday 15 April
Last to discontinue (Discontinued - Fail)	Friday 3 June
Semester Two- units of study	**Dates**
Last day to add a unit	Friday 5 August
Last day for withdrawal	Wednesday 31 August
Last day to discontinue without failure (DNF)	Friday 9 September
Last day to discontinue (Discontinued - Fail)	Friday 28 October
Last day to withdraw from a non-standard unit of study	Census date of the unit, which cannot be earlier than 20 per cent of the way through the period of time during which the unit is undertaken.
Public holidays	**Dates**
Australia Day	Wednesday 26 January
Good Friday	Friday 22 April
Easter Monday	Tuesday 26 April
Anzac Day	Monday 25 April
Queen's Birthday	Monday 13 June
Labour Day	Monday 3 October

Contents

Welcome from the Dean

Welcome to the Faculty of Engineering and Information Technologies at the University of Sydney.

Our faculty has a long, proud history since 1883 producing many distinguished graduates who have made significant contributions to infrastructure developments - both here and overseas. They have also played major roles in stimulating the Australian economy through inspirational technological developments.

Engineers and Information Technology professionals create new structures, systems and products to support the growth of communities and they rely on an understanding of mathematics and science as well as knowledge of business and legal processes. Our graduates receive a well-rounded understanding of the fundamentals and have acquired design and research skills in preparation for them to lead innovation and shape our future.

The attributes of our graduates include being able to: create new knowledge and understanding through the process of research and inquiry, use information effectively, work independently and sustainably in a way that is informed by openness, curiosity and a desire to meet new challenges, hold personal values and beliefs consistent with their role as responsible community members, and recognise and value communication as a tool for negotiating and creating new understanding, interacting with others, and furthering their own learning.

The faculty has strong research and education links with Australian and global industry through our Foundations, world leading Research Centres and outstanding Alumni. These relationships are energised through collaborative research, consulting projects and industry and community relevant teaching programs.

The combination of our degrees with those of Science, Commerce, Medical Science, Arts and Law, also provide exciting and flexible pathways to suit the needs of our diverse student population.

We hope that you enjoy your educational journey at the University of Sydney and that this will stimulate a rich and lasting relationship with us.

Professor Archie Johnston FTSE, FAICD
Dean, Faculty of Engineering and Information Technologies
November, 2010

1. Resolutions of the Senate for the Faculty of Engineering and Information Technologies

The Senate Resolutions for the Faculty of Engineering and Information Technologies must be read in conjunction with the appropriate Resolutions for the Faculty of Engineering and Information Technologies the individual Course resolutions and rules.

Resolutions of the Senate

1 Degrees, diplomas and certificates of the Faculty of Engineering and Information Technologies

(1) With the exception of the Doctor of Engineering and the Doctor of Philosophy, 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 Engineering and Information Technologies. The Doctor of Engineering and the Doctor of Philosophy 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, 2011. Degrees, diplomas and certificates no longer open for admission will be conferred by the Senate according to the rules previously specified by the Faculty.

2 Degrees

Code	Course title & stream	Abbreviation	Credit points
HA002	Doctor of Engineering	DEng	Published work
HB002	Doctor of Engineering Practice	DEngPrac	Research
HB000	Doctor of Philosophy	PhD	Research
HC051	Master of Philosophy	MPhil	Research
HC048	Master of Engineering	ME	48
HC049	Master of Information Technology	MIT	48
HC050	Master of Information Technology Management	MITM	48
HC052	Master of Professional Engineering		
	Aerospace Engineering	MPE(Aerospace)	96
	Biomedical Engineering	MPE(Biomedical)	96
	Chemical and Biomolecular Engineering	MPE(ChemicalandBiomolecular)	96
	Civil Engineering	MPE(Civil)	96
	Electrical Engineering	MPE(Electrical)	96
	Environmental Fluids	MPE(EnvironmentalFluids)	96
	Geotechnical Engineering	MPE(Geotechnical)	96
	Mechanical Engineering	MPE(Mechanical)	96
	Network Engineering	MPE(Network)	96
	Power Engineering	MPE(Power)	96
	Software Engineering	MPE(Software)	96
	Structural Engineering	MPE(Structural)	96
	Wireless Engineering	MPE(Wireless)	96
HC031	Master of Project Management	MPM	48
HH043	Bachelor of Computer Science and Technology*		
	Computer Science	BCST(ComputerScience)	144
	Information Systems	BCST(InformationSystems)	144
HH043	Bachelor of Computer Science and Technology (Advanced)*		
	Computer Science	BCST(Adv)(ComputerScience)	144
	Information Systems	BCST(Adv)(InformationSystems)	144
HH000	Bachelor of Engineering^		
	Aeronautical Engineering	BE(Aeronautical)	192
	Aeronautical Engineering (Space)	BE(Aeronautical)(Space)	192
	Chemical and Biomolecular Engineering	BE(ChemicalandBiomolecular)	192
	Civil Engineering	BE(Civil)	192
	Civil Engineering (Construction Management)	BE(Civil)(ConstructionManagement)	192
	Civil Engineering (Environmental)	BE(Civil)(Environmental)	192
	Civil Engineering (Geotechnical)	BE(Civil)(Geotechnical)	192
	Civil Engineering (Structures)	BE(Civil)(Structures)	192

Code	Course title & stream	Abbreviation	Credit points
	Computer Engineering	BE(Computer)	192
	Electrical Engineering	BE(Electrical)	192
	Electrical Engineering (Bioelectronics)	BE(Electrical)(Bioelectronics)	192
	Electrical Engineering (Computer)	BE(Electrical)(Computer)	192
	Electrical Engineering (Power Engineering)	BE(Electrical)(Power)	192
	Electrical Engineering (Telecommunications)	BE(Electrical)(Telecommunications)	192
	Mechanical Engineering	BE(Mechanical)	192
	Mechanical Engineering (Biomedical)	BE(Mechanical)(Biomedical)	192
	Mechanical Engineering (Space)	BE(Mechanical)(Space)	192
	Mechatronic Engineering	BE(Mechatronic)	192
	Mechatronic Engineering (Space)	BE(Mechatronic)(Space)	192
	Project Engineering and Management (Civil)	BE(ProjectEngineeringandManagement)(Civil)	192
	Software Engineering	BE(Software)	192
HH041	Bachelor of Information Technology^		
	Computer Science	BIT(ComputerScience)	192
	Information Systems	BIT(InformationSystems)	192

**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
HH016	Bachelor of Engineering^/Bachelor of Arts*	BE/BA	240
HH014	Bachelor of Engineering^/Bachelor of Commerce*	BE/BCom	240
HH046	Bachelor of Engineering^/Bachelor of Design in Architecture*	BE/BDesArch	240
HH018	Bachelor of Engineering^/Bachelor of Laws^	BE/LLB	288
HH021	Bachelor of Engineering^/Bachelor of Medical Science*	BE/BMedSci	240
HH015	Bachelor of Engineering^/Bachelor of Science*	BE/BSc	240
HH047	Bachelor of Information Technology^/Bachelor of Arts*	BIT/BA	240
HH042	Bachelor of Information Technology^/Bachelor of Commerce*	BIT/BCom	240
HH051	Bachelor of Information Technology^/Bachelor of Laws^	BIT/LLB	288
HH048	Bachelor of Information Technology^/Bachelor of Medical Science*	BIT/BMedSc	240
HH049	Bachelor of Information Technology^/Bachelor of Science*	BIT/BSc	240

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

4 Graduate diplomas

Code	Course title	Abbreviation	Credit points
HF041	Graduate Diploma in Computing	GradDipComp	48
HF044	Graduate Diploma in Engineering	GradDipEng	36
HF045	Graduate Diploma in Engineering (Professional Engineering)	GradDipEng(ProfEng)	48
HF042	Graduate Diploma in Information Technology	GradDipIT	36
HF043	Graduate Diploma in Information Technology Management	GradDipITM	36
HF023	Graduate Diploma in Project Management	GradDipPM	36

5 Graduate certificates

Code	Course title	Abbreviation	Credit points
HG027	Graduate Certificate in Engineering	GradCertEng	24
HG007	Graduate Certificate in Greenhouse Gas Mitigation	GradCertGHGMit	24
HG025	Graduate Certificate in Information Technology	GradCertIT	24
HG026	Graduate Certificate in Information Technology Management	GradCertITM	24
HG006	Graduate Certificate in Project Management	GradCertPM	24

2. Resolutions of the Faculty of Engineering and Information Technologies

Resolutions of the Faculty of Engineering and Information Technologies 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 2000 (the 'Coursework Rule'), the resolutions for the course of enrolment, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended)and the Academic Board policies on Academic Dishonesty and Plagiarism.

Part 1: Course enrolment

1 Enrolment restrictions

(1) Except as with the permission of the Dean an undergraduate student shall satisfy the following enrolment requirements.
- (a) No more than 54 credit points in semester one and two combined;
- (b) No more than 30 credit points in either semester one or two;
- (c) No more than 12 credit points in the summer session and 6 credit points in the winter session;
- (d) For a student on the 'at risk' register, no more than 24 credit points in either semester one or two;
- (e) In the first year of an Engineering or Engineering/Combined degree a student must enrol on a fulltime basis with a minimum of 24 credit points per semester;
- (f) In subsequent years of an Engineering or Engineering/Combined degree a student must enrol on a fulltime basis with a minimum of 18 credits per semester unless the student has completed a total of 153 credit points toward the degree;
- (g) In first year, a student may only enrol in level 1000 units of study;
- (h) In second year, a student may only enrol in level 1000 and/or level 2000 units of study;
- (i) A student shall enrol in any core units of study for which he or she was qualified to enrol in any previous year and for which credit has not yet been gained.

2 Flexible First Year

(1) Undergraduate students entering first year may choose to undertake the Flexible First Year program, instead of choosing a particular degree or stream. Two types of Flexible First Year program are available:
- (a) Students planning on entering Aeronautical, Mechanical (Biomedical), Chemical and Biomolecular, Civil, Project Management, Mechanical, Aeronautical (Space) or Mechanical (Space) Engineering streams can enrol in program A as set out in the Bachelor of Engineering Flexible First Year table of units of study. Students in this program undertake a common set of units in semester one. They can then transfer to a stream in semester two or at the end of the year. The semester two enrolment will consist of common units and a choice of core or elective units for the stream that students plan to pursue in later years.
- (b) Students planning on entering Electrical, Electrical(Bioelectronics), Electrical (Computer), Electrical (Power), Electrical(Telecommunications), Mechatronics, Mechatronics (Space), Software Engineering or the Bachelor of Computer Science and Technology or Bachelor of Information Technology degrees can enrol in program B as set out in the Bachelor of Engineering Flexible First Year table of units of study. Students in this program undertake a common set of units in semester one. They can then transfer to a stream or degree in semester two or at the end of the year. The semester two enrolment will consist of common units and a choice of core or elective units for the stream or degree that students plan to undertake in later years.

(2) Students gaining entry to any of the combined degree courses may also choose to undertake the Flexible First Year program.

(3) Those students who have met the requirements for first year entry (ATAR cut-off) into a particular degree and stream will be guaranteed a place in second year in that stream or degree even though they choose the Flexible First Year program. Students attaining high average marks in the Flexible First Year program will be eligible to apply for second year entry into higher ATAR cut-off degrees or streams. See transfer requirements in the table shown below. These conditions for entry into a second year specialist degree or stream will also apply for combined degree candidates.

(4) Transfer from Flexible First Year into streams or degrees will be assessed based on either of the following two conditions:
- (a) Students have met the ATAR requirement for the degree or stream at the time of initial enrolment; or
- (b) Students have achieved an average mark as shown in the following requirements table. For Program A the average mark is based on the performance in first year units of study. For Program B, the average mark is based on performance in first year, first semester units of study.

(5) *Degree/stream transfer table*

Degree/Stream	Flexible entry program	AAM requirement
BE(Aero)	A	65
BE(Aero)(Space)	A	75
BE(Chem)	A	always allowed
BE(Civil)	A	always allowed
BE(Civil)(Construction)	A	65
BE(Civil)(Environmental)	A	65
BE(Civil)(Geotechnical)	A	65
BE(Civil)(Structures)	A	65
BE(Electrical)	B	always allowed
BE(Electrical)(Bioelectronics)	B	65
BE(Electrical) (Computer)	B	65
BE(Electrical)(Power)	B	65
BE(Electrical)(Telecom)	B	65
BE(Mechanical)	A	always allowed
BE(Mech)(Biomedical)	A	70
BE(Mech)(Space)	A	75
BE(Mechatronics)	B	70
BE(Mechatronics)(Space)	B	75
BE(Project Mgt)(Civil)	A	65
BE(Software)	B	65
BCST	B	always allowed

Degree/Stream	Flexible entry program	AAM requirement
BCST(Adv)	B	70
BIT	B	70

3 Transferring Streams or Degrees

(1) Students admitted to specific undergraduate degrees or streams wishing to transfer between degrees or streams need to apply to the head of the school supervising the degree or stream. Students will be assessed based on the above Flexible First Year average mark criteria but will also be required to show that they have met progression requirements in their current degree or stream as specified by the school and that they will able to complete the new stream in the normal time period.
(2) Students who wish to transfer to an undergraduate combined degree or any other course outside the administration of the Faculty must apply to the Universities Admissions Centre or International Office as appropriate.
(3) Students admitted to specific postgraduate degrees or streams wishing to transfer between degrees or streams managed by the faculty need to apply to the Director of the Graduate School of Engineering. Students will be assessed based on their progress in their current degree or stream and that they will able to complete the new stream in the normal time period.

4 Time limits

(1) Unless the course rules specify differently:
  (a) A student must complete all the requirements for a coursework doctorate, within ten calendar years of first enrolment;
  (b) A student must complete all the requirements for a combined BE, single or combined BIT, and BCST within ten calendar years of first enrolment;
  (c) A student must complete all the requirements for a single (non combined) BE within the lesser of 16 enrolled semesters or ten calendar years of first enrolment;
  (d) A student must complete all the requirements for a graduate certificate within two calendar years of first enrolment;
  (e) A student must complete all the requirements for a graduate diploma within four calendar years of first enrolment;
  (f) A student must complete all the requirements for a master's degree within six calendar years of first enrolment.
(2) Periods of suspension, exclusion or lapsed candidature will be added to maximum completion times except that no completion time will exceed 10 years from first enrolment.
(3) Credit will not be granted for recognised prior learning older than 10 years at the time of first enrolment.

5 Suspension, discontinuation and lapse of candidature

The Coursework Rule specifies the conditions for suspending or discontinuing candidature, and return to candidature after these events. The Rule also defines the circumstances when candidature is deemed to have lapsed. Students should pay careful attention to the significant dates in these processes and their effect on results and financial liability. Students seeking to suspend, discontinue or apply for a return to candidature after a lapse must apply to the Dean of Engineering and IT for permission, supplying detailed reasons and evidence to support the request.

6 Credit for previous study

(1) Conditions for the granting of credit for previous study are in accordance with the Coursework Rule, except:
  (a) the maximum credit that may be granted to the Bachelor of Engineering degree, Bachelor of Engineering/Combined degrees, Bachelor of Information Technology degree or Bachelor of information Technology/Combined degrees is 96 credit points;
  (b) the maximum credit that may be granted to the Bachelor of Computer Science and Technology or Bachelor of Science and Technology(Advanced) is 48 credit points; and
  (c) where Course resolutions make other specifications.

Part 2: Unit of study enrolment

7 Cross-institutional study

(1) Provided permission has been obtained in advance, the Dean may permit a student to complete a unit of study at another institution and have that unit credited to the student's course requirements, provided that:
  (a) the resolutions of the student's course of enrolment do not specifically exclude cross-institutional study; and
  (b) the unit of study content is not taught in any corresponding unit of study at the University; or
  (c) the student is unable, for good reason, to attend a corresponding unit of study at the University.

8 International exchange

The faculty encourages students to participate in international exchange programs, unless specified otherwise in the resolutions for a particular course. Students must apply to the Head of the relevant School of Engineering and IT to obtain approval for their planned enrolment while on exchange. This guarantees that the units completed externally will be correctly matched to the core requirements of their Course.

Part 3: Studying and Assessment

9 Attendance

(1) Students are required to be in attendance at the correct time and place of any formal or informal examinations. Non attendance on any grounds insufficient to claim special consideration will result in the forfeiture of marks associated with the assessment. Participation in a minimum number of assessment items may be a requirement of any unit of study.
(2) Students are expected to attend a minimum of 90% of timetabled activities for a unit of study, unless granted exemption by the Dean or Head of School most concerned. The Dean or Head of School most concerned may determine that a student fails a unit of study because of inadequate attendance. Alternatively, at their discretion, they may set additional assessment items where attendance is lower than 90%.

10 Special consideration for illness, injury or misadventure

Special consideration is a process that affords equal opportunity to students who have experienced circumstances that adversely impact their ability to adequately complete an assessment task in a unit of study. The Coursework Rule provides full details of the University policy and procedures.

11 Concessional pass

In this Faculty the grade PCON (Concessional Pass) is not awarded.

12 Re-assessment

The Faculty does not offer opportunities for re-assessment other than on the grounds of approved special consideration.

Part 4: Progression, Results and Graduation

13 Satisfactory progress

The Faculty will monitor students for satisfactory progress towards the completion of their award course. In addition to the common triggers used to identify students not meeting academic progression requirements (as defined by the Progression requirements of the Coursework Rule), students must pass any unit of study identified in the course resolutions as being critical to progression through the course.

14 Award of the bachelor's degree with honours

Honours is available to meritorious students as either appended honours or integrated honours. Admission, requirements and award for the honours courses are in accordance with the relevant course resolutions.

15 Weighted average mark (WAM)

(1) 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. The University WAM is calculated using the following formula:

$$WAM = \frac{sum(Wc \times Mc)}{sum(Wc)}$$

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 and DF is zero. Pass/ fail units and a grade of DNF or credited units from other institutions are not counted.

(2) For undergraduate students in Engineering and IT courses, the weightings are 0 for 1000 level units, 2 for 2000 level units, 3 for 3000 level units and 4 for 4000 level or above units. For postgraduate students in Engineering and IT courses, the weighting is 1 for all units of study.

16 Faculty of Engineering and Information Technologies specific Weighted Average Mark Indicators.

(1) *Intermediate/Senior Weighted average mark (ISWAM)*

The faculty of Engineering and Information Technologies uses an Intermediate/Senior Weighted average mark (ISWAM) to determine eligibility for entry to undergraduate Honours pathways or programs. ISWAM is calculated by applying the university WAM formula to all Level 2000 and Level 3000 units of study only. An ISWAM of 65 is required for entry to Honours pathways in the Faculty of Engineering and Information Technologies.

(2) *Honours Weighted Average Mark (HWAM)*

(a) HWAM is the honours weighted average mark for Bachelor of Engineering undergraduate courses. HWAM is calculated by applying the university WAM formula, with the additional condition that research thesis units of study are given double weighting of 8.

(b) The HWAM is used for honours assessment in Bachelor of Engineering degrees including combined degrees. All units of study attempted in a Bachelor of Engineering single or combined degree are included in the calculation regardless of whether they are core Bachelor of Engineering program units or not.

Part 5: Other

17 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) Students who commenced prior to 1 January, 2011 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

3. Undergraduate degrees

Bachelor of Engineering

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH000	Bachelor of Engineering

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) The Bachelor of Engineering is available in the following streams:
- (a) *School of Aerospace, Mechanical and Mechatronic Engineering*
  - (i) Aeronautical Engineering
  - (ii) Aeronautical Engineering (Space)
  - (iii) Mechanical Engineering
  - (iv) Mechanical Engineering (Biomedical)
  - (v) Mechanical Engineering (Space)
  - (vi) Mechatronic Engineering
  - (vii) Mechatronic Engineering (Space)
- (b) *School of Chemical and Biomolecular Engineering*
  - (i) Chemical and Biomolecular Engineering
- (c) *School of Civil Engineering*
  - (i) Civil Engineering
  - (ii) Civil Engineering (Construction Management)
  - (iii) Civil Engineering (Environmental)
  - (iv) Civil Engineering (Geotechnical)
  - (v) Civil Engineering (Structures)
  - (vi) Project Engineering and Management (Civil)
- (d) *School of Electrical and Information Engineering*
  - (i) Electrical Engineering
  - (ii) Electrical Engineering (Bioelectronics)
  - (iii) Electrical Engineering (Computer)
  - (iv) Electrical Engineering (Power)
  - (v) Electrical Engineering (Telecommunications)
  - (vi) Software Engineering

(2) Completion of a stream is a requirement of the course.

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), 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.

(2) In addition, applicants who have completed the requirements of a Bachelor of Science or equivalent qualification, with a minimum WAM of 50, may apply for admission to the Bachelor of Engineering.

5 Requirements for award

(1) The units of study that may be taken for the course are set out in the Bachelor of Engineering Flexible First Year table of units of study, and the tables of units of study for the specialised stream in the degree.

(2) To qualify for the award of the pass degree, a candidate must successfully complete 192 credit points, comprising:
- (a) core and elective units of study relating to the specialist stream, as prescribed by the table of units of study for the stream; and
- (b) any additional free electives units of study as may be necessary to gain credit to complete the award.

6 Requirements for the Honours degree

(1) Honours is available to meritorious candidates who complete an alternative set of units of study in the final year of the program. Admission to the honours program is by permission of the program coordinator after the completion of third year. Admission to the honours program is by permission of the program coordinator after the completion of the necessary pre-requisites of the Honours Thesis and any other applicable progression requirements. Admission requires an ISWAM of at least 65.

(2) To qualify for the award of the honours degree a candidate must complete the requirements for the pass degree and the following additional requirements:
- (a) any additional Honours units as shown in the table of units for the degree specialisation;
- (b) achieve a minimum Honours Weighted Average Mark (HWAM) of 65; and
- (c) complete the requirements within a time limit of 5 years for a single Bachelor of Engineering degree or complete the requirements within a time limit of 6 years for a combined Engineering degree.

(3) The grade of honours will be determined by the HWAM.

(4) In exceptional circumstances the head of the relevant school may recommend to the Dean that the conditions for the award of honours be varied.

7 Award of the degree

(1) The Bachelor of Engineering is awarded in the grades of either Pass or Honours. The Bachelor of Engineering honours degree is awarded in classes ranging from First Class to Second Class, Division Two. The various classes of honours are awarded on the basis of a candidate's HWAM.

Description	HWAM Range
Honours Class I	75 <= HWAM
Honours Class II (Division 1)	70 <= HWAM < 75
Honours Class II (Division 2)	65 <= HWAM < 70
Honours not awarded	HWAM < 65

(2) A candidate who does not meet the requirements for the award of honours, but who has otherwise satisfied the requirements of the Bachelor of Engineering shall graduate with the pass degree.

8 University Medal

A student with an HWAM of 85 or above and who meets the criteria for Honours may be awarded a university medal. The medal is awarded at the discretion of the Faculty to the highest achieving student in each stream who in the opinion of the Faculty has an outstanding academic record, in accordance with the Coursework Rule.

9 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.

Bachelor of Computer Science and Technology

Bachelor of Computer Science and Technology (Advanced)

Bachelor of Computer Science and Technology (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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH043	Bachelor of Computer Science and Technology
HH043	Bachelor of Computer Science and Technology (Advanced)
HH044	Bachelor of Computer Science and Technology (Honours)
HH044	Bachelor of Computer Science and Technology (Advanced) (Honours)

2 Attendance pattern

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

3 Admission to candidature

(1) Admission to these courses 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.

(2) Candidates for the Bachelor of Science at the University of Sydney may apply to transfer their candidature to the Bachelor of Computer Science and Technology, or the Advanced degree, providing that the applicant has completed 1000-level units of study in mathematics and computer science equivalent to the those specified in the Bachelor of Computer Science and Technology table of units.

4 Requirements for award

(1) The units of study that may be taken for the degrees are set out in the table of units of study: Bachelor of Computer Science and Technology.

(2) To qualify for the award of the Bachelor of Computer Science and Technology, a candidate must successfully complete 144 credit points, comprising:
  (a) core units of study for a Computer Science stream or an Information Systems stream as shown in the units of study tables for this course;
  (b) 18 credit points of selected Mathematics and Statistics units, with at least six credit points at 2000-level or above;
  (c) a maximum of 54 credit points of elective units of study for either stream;
  (d) and ensuring
    (i) no more than 72 credit points in junior (1000-level) units of study; and
    (ii) at least 36 credit points in 3000-level or above.

(3) To qualify for the award of the Bachelor of Computer Science and Technology (Advanced), a candidate must successfully complete 144 credit points specified in the Bachelor of Computer Science and Technology above, except:
  (a) a minimum of 12 credit points of 2000-level core and recommended elective units are at the Advanced level; and
  (b) a minimum of 12 credit points of 3000-level core and recommended elective units are at the Advanced level.

5 Streams

(1) Completion of a stream is a requirement of the course. Candidates have the option of completing up to two streams. Candidates must follow the progression of study as prescribed by the table of units of study for the stream. Units of study counted towards one stream may not count toward any other stream completed. The streams available are:
  (a) Computer Science
  (b) Information Systems.

6 Progression rules

Candidates for the Bachelor of Computer Science and Technology (Advanced) must maintain a credit average in each year of enrolment. If this level of result is not achieved, candidates will be transferred to the Bachelor of Computer Science and Technology degree program with full credit for units of study already completed.

7 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. Part-time study is permitted if the Head of School is satisfied the candidate cannot undertake full-time study.

(2) To qualify for admission to the honours year a candidate should:
  (a) have qualified for, or been awarded, the pass degree or an equivalent degree from another university, including a stream or major in the intended area of study;
  (b) have a ISWAM of at least 65; and
  (c) have the permission of the relevant Head of School.

(3) To qualify for the award of the honours degree a candidate must complete 48 credit points of honours units of study from the Honours Table, as prescribed by the Head of School. The honours mark is determined by calculating a WAM from the 48 credit points of honours level units of study.

(4) Candidates qualified to enrol in two honours streams may either:
  (a) complete the honours courses in the two streams separately and in succession; or
  (b) complete a joint honours course, equivalent to an honours course in a single stream, in the two streams.

(5) A joint honours course shall comprise such parts of the two honours courses as may be decided by the Head of School.

8 Award of the degree

(1) The Bachelor of Computer Science and Technology and the Bachelor of Computer Science and Technology (Advanced) are awarded in the grades of either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Third Class as below:

Description	Honours Mark Range
Honours Class I	80 <= WAM
Honours Class II (Division 1)	75 <= WAM < 80
Honours Class II (Division 2)	70 <= WAM < 75

Description	Honours Mark Range
Honours Class III	65 <= WAM < 70
Honours not awarded	WAM < 65

(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.

9 University Medal

A student with an honours mark of 90 or above and a minimum ISWAM of 80 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.

10 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.

Bachelor of Information Technology

Bachelor of Information Technology (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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH041	Bachelor of Information Technology
HH045	Bachelor of Information Technology (Honours)

2 Attendance pattern

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

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), 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.

(2) Applicants from other Engineering and Information Technologies or Science degree programs at the University of Sydney who have completed at least 48 credit points may be permitted to transfer to the Bachelor of Information Technology degree if their mark averaged over all attempted units of study is 70 or greater.

4 Requirements for award

(1) The units of study that may be taken for the courses are set out in the Bachelor of Information Technology units of study table.

(2) To qualify for the award of the pass degree, a candidate must successfully complete 192 credit points, comprising:
- (a) a minimum of 144 credit points of core and selected core units of study in the chosen stream; and
- (b) 18 credit points of selected Mathematics and Statistics units, with at least six credit points at 2000-level or above; and
- (c) 30 credit points of elective units of study;
- (d) and ensuring:
  - (i) no more than 72 credit points in junior (1000-level) units of study, and
  - (ii) at least 84 credit points in 3000-level or above units of study.

5 Streams

(1) Completion of a stream is a requirement of the course. Candidates have the option of completing up to two streams. Candidates must follow the progression of study as prescribed by the table of units of study for the stream. The streams available are:
- (a) Computer Science
- (b) Information Systems.

6 Progression rules

Candidates must maintain a credit average in 1000 and 2000-level core units. If this level of result is not achieved, candidates will be transferred to the Bachelor of Computer Science and Technology degree program with full credit for units of study already completed.

7 Requirements for the Honours degree

(1) Honours is available to meritorious candidates who complete an alternative set of units of study in the final year of the program. Candidates shall complete the requirements for the honours course full-time over two consecutive semesters. Part-time study is permitted if the Head of Department/ Discipline/ Program Coordinator is satisfied the candidate cannot undertake full-time study.

(2) Admission to the honours program is by permission of the program coordinator after the completion of third year. Admission requires an ISWAM of at least 65 in units of study completed to that point.

(3) To qualify for the award of the honours degree a candidate must complete the requirements for the pass degree but include the alternative 24 credit point honours pathway described in the table of units for the degree, 24 credit points in 4000 or 5000-level selected core units of study and achieve a Computer Science Honours Result of 65 or above. Completion of the degree is required in the minimum standard full time duration. The honours mark will be determined by calculating the WAM in all 4000 and 5000-level units completed.

(4) Candidates qualified to enrol in two honours courses may either:
- (a) complete the honours courses in the two streams separately and in succession; or
- (b) complete a joint honours course, equivalent to an honours course in a single stream, in the two streams.

(5) A joint honours course shall comprise such parts of the two honours courses as may be decided by the Dean.

8 Award of the degree

(1) The Bachelor of Information Technology is awarded in the grades of either Pass or Honours. The honours degree is awarded in classes ranging from First Class to Third Class as below:

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

(2) A candidate who does not meet the requirements for the award of honours but who have otherwise satisfied the requirements of the Bachelor of Information Technology shall graduate with the pass degree.

9 University Medal

A student with an honours mark of 90 or above and a minimum ISWAM of 80 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.

10 Course transfer

(1) Candidates may apply to the Dean for permission to transfer candidature to the Bachelor of Computer Science and Technology. There is no WAM requirement for candidates

wishing to transfer to the standard Bachelor of Computer Science and Technology degree.

(2) Candidates enrolled in the Bachelor of Information Technology who have satisfied the requirements of the Bachelor of Science, Bachelor of Science (Advanced), Bachelor of Computer Science and Technology or Bachelor of Computer Science and Technology (Advanced) may elect to transfer to such degree with the permission of the faculty.

11 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.

4. Undergraduate combined and double degrees

Bachelor of Engineering 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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH016	Bachelor of Engineering and Bachelor of Arts

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) Streams available for the Bachelor of Engineering are listed under the course resolution for the Bachelor of Engineering.
(2) Completion of a stream is a requirement of the Bachelor of Engineering.

4 Cross faculty management

(1) Candidates in this combined degree program will be under the general supervision of the Faculty of Engineering and Information Technologies for the duration of the combined program.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Arts 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 Bachelor of Engineering are set out in the tables of units of study for the specialised streams from the Faculty of Engineering and Information Technologies.
(2) The units of study that may be taken for the Bachelor of Arts are set out in Table A from the Faculty of Arts Tables of units of study.
(3) To qualify for the award of the combined degree, a candidate must complete 240 credit points.
(4) For the Bachelor of Engineering a candidate must complete all units of study prescribed in the table of units for the Bachelor of Engineering stream the candidate is pursuing.
(5) For the Bachelor of Arts a candidate must complete a total of 84 credit points from Table A, including:
    (a) a major from Table A;
    (b) a minimum 54 credit points of 2000/3000 level units of study.

7 Majors

Completion of a Table A major is a requirement of the Bachelor of Arts component of the combined degree. The list of Table A majors is specified in the resolutions of the Faculty of Arts.

8 Requirements for the Honours degree

(1) Honours is available to meritorious candidates, in either or both the Bachelor of Engineering or Bachelor of Arts. The Bachelor of Arts Honours program may be completed part time over two years with permission of the administering department or program.
(2) Admission and award requirements for honours in the Bachelor of Engineering are listed in the resolution for the Bachelor of Engineering degree. Admission and award requirements for honours in the Bachelor of Arts are listed in the resolutions of the Faculty of Arts.

9 Award of the degrees

(1) Candidates will be awarded a separate testamur for each degree completed.
(2) The Bachelor of Engineering and the Bachelor of Arts are awarded in the grades of either Pass or Honours. The Bachelor of Engineering honours degree is awarded in classes ranging from First Class to Second Class, and the Bachelor of Arts 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 Engineering and Information Technologies and Faculty of Arts.
(3) Candidates who do not meet the requirements for the award of the Bachelor of Engineering (Honours) but who have otherwise satisfied the requirements of the Bachelor of Engineering shall graduate with the pass degree.
(4) Candidates for the award of the Bachelor of Arts (Honours) who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

10 Course transfer

A candidate may abandon the combined program and elect to complete either the Bachelor of Engineering or the Bachelor of Arts in accordance with the resolutions governing that degree. Completion of the abandoned degree 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, 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.

Bachelor of Engineering and Bachelor of Commerce

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH014	Bachelor of Engineering and Bachelor of Commerce

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) Streams available for the Bachelor of Engineering are listed under the course resolution for the Bachelor of Engineering.
(2) Completion of a stream is a requirement of the Bachelor of Engineering.

4 Cross faculty management

(1) Candidates in this combined degree will be under the general supervision of the Faculty of Engineering and Information Technologies for the duration of the combined program.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Economics and Business 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 Bachelor of Engineering are set out in the tables of units of study for the specialised streams from the Faculty of Engineering and Information Technologies.
(2) The units of study that may be taken for the Bachelor of Commerce are set out in the Table of undergraduate units of study from the Faculty of Economics and Business.
(3) To qualify for the award of the combined degree, a candidate must successfully complete 240 credit points.
(4) For the Bachelor of Engineering, candidates must complete all units of study prescribed in the table of units for the Bachelor of Engineering stream the candidate is pursuing.
(5) For the Bachelor of Commerce, candidates must complete 96 credit points of units of study selected from the Table of undergraduate units of study from the Faculty of Economics and Business including:
    (a) 36 credit points of core units of study (30 junior credit points and six senior credit points); and
    (b) a major; and
    (c) at least 48 credit points at 2000 and/or 3000 levels.

7 Majors

Completion of a major is a requirement of the Bachelor of Commerce component of the combined degree. The majors available and requirements are outlined in the resolutions for the Bachelor of Commerce.

8 Requirements for the Honours degree

(1) Honours is available to meritorious candidates, in either or both the Bachelor of Engineering or Bachelor of Commerce. The Bachelor of Commerce Honours program may be completed part time over two years with the permission of the Faculty of Economics and Business.
(2) Admission and award requirements for honours in the Bachelor of Engineering are listed in the resolution for the Bachelor of Engineering degree. Admission and award requirements for honours in the Bachelor of Commerce are listed in the resolutions of the Faculty of Economics and Business.

9 Award of the degrees

(1) Candidates will be awarded a separate testamur for each degree completed.
(2) The Bachelor of Engineering and the Bachelor of Commerce are awarded in the grades of either Pass or Honours. The Bachelor of Engineering honours degree is awarded in classes ranging from First Class to Second Class, and the Bachelor of Commerce 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 Engineering and Information Technologies and Faculty of Economics and Business.
(3) Candidates who do not meet the requirements for the award of the Bachelor of Engineering (Honours) but have otherwise satisfied the requirements of the Bachelor of Engineering shall graduate with the pass degree.
(4) Candidates for the award of the Bachelor of Commerce (Honours) who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

10 Course transfer

A candidate may abandon the combined program and elect to complete either the Bachelor of Engineering or the Bachelor of Commerce in accordance with the resolutions governing that degree. Transfer from a combined degree to the Bachelor of Commerce is also conditional on the student having met the entry requirements of the Bachelor of Commerce in force at the time of their enrolment in the combined 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.

11 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.

Bachelor of Engineering and Bachelor of Design in Architecture

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH046	Bachelor of Engineering and Bachelor of Design in Architecture

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) The Bachelor of Engineering is available only in the Civil Engineering stream in this combined degree program. Completion of a stream is a requirement of the Bachelor of Engineering.
(2) Streams available for the Bachelor of Design in Architecture are listed under the course resolution for the Bachelor of Design in Architecture. Completion of a stream is not a requirement of the course. Candidates may transfer between streams in the Bachelor of Design in Architecture.

4 Cross faculty management

(1) Candidates in this combined degree program will be under the general supervision of the Faculty of Engineering and Information Technologies for the duration of the combined program.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Architecture, Design and Planning 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

To qualify for the award of the combined degree, a candidate must successfully complete 240 credit points in accordance with the unit of study tables for the Civil Engineering combined with Design in Architecture degree.

7 Requirements for the Honours degree

(1) Honours is available to meritorious candidates, in either or both the Bachelor of Engineering or the Bachelor of Design in Architecture.
(2) Admission and award requirements for honours in the Bachelor of Engineering are listed in the resolution for the Bachelor of Engineering degree. Admission and award requirements for honours in the Bachelor of Design in Architecture are listed in the resolutions of the Faculty of Architecture, Design and Planning.

8 Award of the degrees

(1) Candidates will be awarded a separate testamur for each degree completed.
(2) The Bachelor of Engineering and the Bachelor Design in Architecture are awarded in the grades of either Pass or Honours. The honours degrees are awarded in classes ranging from First Class to Second Class according to the rules specified in the Resolutions of the Faculty of Engineering and Information Technologies and the Faculty of Architecture, Design and Planning.
(3) Candidates who do not meet the requirements for the award of the Bachelor of Engineering (Honours) but have otherwise satisfied the requirements of the Bachelor of Engineering shall graduate with the pass degree.
(4) Candidates for the award of the Bachelor of Design in Architecture (Honours) who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

9 Course transfer

A candidate may abandon the combined program and elect to complete either the Bachelor of Engineering or the Bachelor of Design in Architecture 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.

10 Transitional provisions

(1) These resolutions apply to persons who commenced their candidature after 1 January, 2011 and persons 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.

Bachelor of Engineering 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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH018	Bachelor of Engineering and Bachelor of Laws

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

Completion of a stream is a requirement of the Bachelor of Engineering. Streams available for the Bachelor of Engineering are listed under the course resolution for the Bachelor of Engineering.

4 Cross-faculty management

(1) Candidates in this combined degree program will be under the general supervision of the Faculty of Engineering and Information Technologies until the end of the semester in which they complete the requirements for the Bachelor of Engineering. They will then be under the supervision of the Faculty of Law.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Law 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 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 this combined degree are set out in the tables of units of study for the specialised streams from the Faculty of Engineering and Information Technologies and in the Faculty of Law Undergraduate Table.
(2) To qualify for the award of the pass degrees in the combined program, a candidate must complete 288 credit points, comprising:
    (a) 144 credit points of units of study from the table of units for the Bachelor of Engineering, appropriate to the stream the candidate is pursuing; and
    (b) 144 credit points of Law units of study, of which 48 credit points are Combined Law compulsory units of study for years 1, 2 and 3 and are credited towards the requirements for both the Bachelor of Engineering and the Bachelor of Laws.
(3) *Requirements for the Bachelor of Engineering*
    To qualify for the award of the Bachelor of Engineering, candidates must complete 192 credit points comprising:
        (i) 48 credit points of Combined Law compulsory units of study for Years 1, 2, and 3; and
        (ii) 144 credit points of units of study from the table of units for the Bachelor of Engineering, appropriate to the stream the candidate is pursuing.
(4) *Requirements for the Bachelor of Laws*
    To qualify for the award of the Bachelor of Laws, candidates must complete 144 credit points taken from the Faculty of Law Undergraduate Table, comprising:
        (i) 102 credit points of compulsory units of study; and
        (ii) 42 credit points of elective units of study, of which a maximum of 36 credit points are taken from Part 1 and a minimum of 6 credit points are taken from Part 2.

7 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 the Bachelor of Laws units of study in the order listed in the Faculty of Law Undergraduate Table.
(3) Except with permission of the Dean of the Faculty of Law, candidates must complete the requirements for the Bachelor of Engineering before proceeding to Year Five of the Bachelor of Laws.

8 Requirements for the Honours degree

(1) Both the Bachelor of Engineering and the Bachelor of Laws may be awarded with honours.
(2) Honours in the Bachelor of Engineering is available to meritorious students who complete an alternative set of units in the final year of the program.
(3) 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 program.
(4) The admission and award requirements for honours in either Engineering or Law are listed in the resolutions of the Bachelor of Engineering and Bachelor of Laws respectively.

9 Award of the degrees

(1) The Bachelor of Engineering and Bachelor of Laws are awarded in the grades of either Pass or Honours.
(2) Honours in the Bachelor of Engineering is awarded in First or Second Class in accordance with the resolutions of the Bachelor of Engineering.
(3) Honours in the Bachelor of Laws is awarded in First Class or Second Class in accordance with the resolutions of the Bachelor of Laws.

10 Course transfer

A candidate may withdraw from the combined degree program and elect to transfer to the Bachelor of Engineering, by written application to the Faculty of Engineering and Information Technologies, 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.

11 Transitional provisions

(1) These resolutions apply to students who commenced their candidature on or after 1 January, 2011.
(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.

Bachelor of Engineering and Bachelor of Medical Science

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH021	Bachelor of Engineering and Bachelor of Medical Science

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) Streams available for the Bachelor of Engineering are listed under the course resolution for the Bachelor of Engineering.
(2) Completion of a stream is a requirement of the Bachelor of Engineering.

4 Cross faculty management

(1) Candidates in this combined degree program will be under the general supervision of the Faculty of Engineering and Information Technologies for the duration of the combined program.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Science 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 Progression rules

General progression rules for the combined degree are covered by the resolutions of the Faculty of Engineering and Information Technologies.

7 Requirements for award

(1) The units of study that may be taken for the Bachelor of Engineering are set out in the tables of units of study for the specialised streams from the Faculty of Engineering and Information Technologies.
(2) The units of study that may be taken for the Bachelor of Medical Science are listed in Table IV for the Bachelor of Medical Science from the Faculty of Science.
(3) To qualify for the award of the combined degree, a candidate must successfully complete 240 credit points.
(4) For the Bachelor of Engineering, candidates must complete all units of study prescribed in the table of units for the Bachelor of Engineering stream the candidate is pursuing, noting that the mathematics requirement for this degree will also satisfy the mathematics requirements for the Bachelor of Medical Science.
(5) For the Bachelor of Medical Science a candidate must complete 102 credit points of units including:
    (a) MBLG1001/1901 Introductory Molecular Biology & Genetics;
    (b) A minimum of 24 credit points from junior Science units of study, including 12 credit points each from Chemistry and Mathematics;
    (c) 48 credit points of intermediate core units of study listed in Table IV for the Bachelor of Medical Science;
    (d) A minimum of 24 credit points of senior Science units of study selected from the subject areas of Anatomy/Histology, Biology (Genetics), Biochemistry, Cell Pathology, Immunology, Infectious Diseases, Microbiology, Pharmacology and/or Physiology.

8 Requirements for the Honours degree

(1) Honours is available to meritorious candidates, in either or both the Bachelor of Engineering or Bachelor of Medical Science. Honours requires the completion of an alternative set of units in the final year of the Bachelor of Engineering degree and of one additional full time year of study for the Bachelor of Medical Science degree. The Resolutions of the Faculty of Science allow for part time honours in certain circumstances.
(2) Admission and award requirements for honours in the Bachelor of Engineering are listed in the resolution for the Bachelor of Engineering degree. Admission and award requirements for honours in the Bachelor of Medical Science are listed in the resolutions of the Faculty of Science.

9 Award of the degrees

(1) Candidates will be awarded a separate testamur for each degree completed.
(2) The Bachelor of Engineering and the Bachelor of Medical Science are awarded in the grades of either Pass or Honours. The Bachelor of Engineering honours degree is awarded in classes ranging from First Class to Second Class, and the Bachelor of Medical Science 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 Engineering and Information Technologies and the Faculty of Science.
(3) Candidates who do not meet the requirements for the award of the Bachelor of Engineering (Honours) but who have otherwise satisfied the requirements of the Bachelor of Engineering shall graduate with the pass degree.
(4) Candidates for the award of the Bachelor of Medical Science (Honours) who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

10 Course transfer

A candidate may abandon the combined program and elect to complete either the Bachelor of Engineering or the Bachelor of Medical 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.

11 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.

Bachelor of Engineering and Bachelor of Science

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH015	Bachelor of Engineering and Bachelor of Science

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) Streams available for the Bachelor of Engineering are listed in the course resolution for the Bachelor of Engineering. Completion of a stream is a requirement of the Bachelor of Engineering.
(2) The Bachelor of Science degree is available in the following streams:
  (a) Advanced
  (b) Advanced Mathematics.
(3) Completion of a stream is not a requirement of the Bachelor of Science. Candidates wishing to transfer between streams should contact the Faculty student office.

4 Cross faculty management

(1) Candidates in this combined degree program will be under the general supervision of the Faculty of Engineering and Information Technologies for the duration of the combined program.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Science 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 Bachelor of Engineering are set out in the tables of units of study for the specialised streams from the Faculty of Engineering and Information Technologies.
(2) The units of study that may be taken for the Bachelor of Science are listed in Table 1 from the Faculty of Science.
(3) To qualify for the award of the combined degree, a candidate must successfully complete 240 credit points, comprising:
  (a) a minimum of 144 credit points of units of study prescribed for the Bachelor of Engineering stream the candidate is pursuing; and
  (b) 96 credit points of Science units of study, including one major in a Science subject area.
(4) Candidates completing the Bachelor of Science in the Advanced or the Advanced Mathematics stream must include as part of the above requirements:
  (a) a minimum of 54 credit points of intermediate or senior Science units of study, of which at least 36 credit points shall be completed at either the Advanced level or as Talented Student Program (TSP) units of study; and
  (b) a minimum of 24 credit points of senior Science units of study at either the Advanced level or as TSP units in a single Science subject area.

7 Majors

Completion of a major is a requirement of the Bachelor of Science component of the combined degree. The list of majors available in the Bachelor of Science is specified in the course resolutions for the Bachelor of Science.

8 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) General progression rules for the combined degree are covered by the resolutions of the Faculty of Engineering and Information Technologies.

9 Requirements for the Honours degree

(1) Honours is available to meritorious candidates, in either or both the Bachelor of Engineering or Bachelor of Science. Honours requires the completion of an alternative set of units in the final year of the Bachelor of Engineering degree and of one additional full time year of study for the Bachelor of Science degree. The Science honours course may be undertaken part time over two years if the Faculty of Science is satisfied the candidate cannot undertake honours full time.
(2) Admission and award requirements for honours in the Bachelor of Engineering are listed in the resolution for the Bachelor of Engineering degree. Admission and award requirements for honours in the Bachelor of Science are listed in the resolutions of the Faculty of Science.

10 Award of the degree

(1) Candidates will be awarded a separate testamur for each degree completed.
(2) The Bachelor of Engineering and the Bachelor of Science are awarded in the grades of either Pass or Honours. The Bachelor of Engineering honours degree is awarded in classes ranging from First Class to Second Class, and the Bachelor of Science honours degree is awarded in classes ranging from First Class to Third Class, according to the rules specified in the Resolutions of the Bachelor of Engineering and the Faculty of Science.
(3) Candidates who do not meet the requirements for the award of the Bachelor of Engineering (Honours) but who have otherwise satisfied the requirements of the Bachelor of Engineering shall graduate with the pass degree.

(4) Candidates for the award of the Bachelor of Science (Honours) 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 Engineering 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 persons who commenced their candidature after 1 January, 2011 and persons 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.

Bachelor of Engineering and Bachelor of Science

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Double degree course resolutions

1 Course codes

Code	Course title
HH000	Bachelor of Engineering
LH000	Bachelor of Science

2 Admission to candidature for the Bachelor of Science after partial completion of the Bachelor of Engineering

(1) A student, at the end of second or third year of candidature for the Bachelor of Engineering, may be admitted to candidature for the Bachelor of Science, to complete the Bachelor of Science degree, if:
  (a) all units of study attempted in the Bachelor of Engineering degree to date have been completed with a grade of pass or better;
  (b) at least 96 credit points from units of study in the Bachelor of Engineering degree have been completed, of which no more than 12 credit points are from units of study with the grade of pass (concessional);
  (c) the candidate is qualified to enrol in a major in a Science area;
  (d) for admission to the advanced streams, the candidate satisfies the relevant requirements in the course resolution for the Bachelor of Science degree.

(2) After completion of the Bachelor of Science, the candidate will return to complete the Bachelor of Engineering according to the resolutions for that degree.

3 Attendance pattern

The attendance pattern for the Bachelor of Science is full time over one year, or part time over two years, according to candidate choice.

4 Streams

(1) The Bachelor of Science degree is available in the following streams:
  (a) Advanced
  (b) Advanced Mathematics.

(2) Completion of a stream is not a requirement of the Bachelor of Science. Candidates wishing to transfer between Science streams should contact the Faculty student office.

5 Cross faculty management

(1) Candidates in this double degree program will be under the supervision of the Faculty of Engineering and Information Technologies for the period of Bachelor of Engineering degree enrolment, and under the supervision of the Faculty of Science for the Bachelor of Science enrolment.

(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Science shall jointly exercise authority in any matter concerned with the combined course not otherwise dealt with in these resolutions.

6 Requirements for award

(1) The units of study that may be taken for the Bachelor of Engineering are set out in the Flexible First Year table of units of study, and the tables of units of study for the specialised streams from the Faculty of Engineering and Information Technologies.

(2) The units of study that may be taken for the Bachelor of Science are listed in Table 1 from the Faculty of Science. 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 the tables.

(3) To qualify for the award of the Bachelor of Science in the double degree program, a candidate must successfully complete a total of 48 credit points, including:
  (a) a minimum of 42 credit points of intermediate/senior units of study in Science subject areas; and
  (b) a major in a Science area.

(4) Candidates completing the Bachelor of Science in the Advanced stream must include as part of the above requirements:
  (a) a minimum of 24 credit points of senior Science units of study at the Advanced level or as TSP units in a single Science subject area.

(5) Candidates completing the Bachelor of Science in the Advanced Mathematics stream must include as part of the above requirements:
  (a) a major in Mathematics, Statistics or Financial Mathematics and Statistics;
  (b) 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;
  (c) a minimum of 24 credit points of senior Science units of study at the Advanced level or as TSP units in the Science subject areas of Mathematics and Statistics.

7 Majors

Completion of a major is a requirement of the Bachelor of Science. The list of majors available in the Bachelor of Science is specified in the course resolutions for the Bachelor of Science.

8 Progression rules

(1) The requirements for Bachelor of Science must be completed in one year of full-time study or two years of part-time study. Candidates who complete at least 42 but less than 48 credit points in the prescribed time limits may, in the following year of enrolment in the Bachelor of Engineering, complete the remaining credit points to satisfy the requirements of the Bachelor of Science. Candidates who complete less than 42 credit points will resume their candidature in the Bachelor of Engineering in the following semester of enrolment.

(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. Failure to maintain the required average will result in candidates being transferred to the Bachelor of Science.

(3) General progression rules for the combined degree are covered by the resolutions of the Faculty of Engineering and Information Technologies.

9 Requirements for the Honours degree

(1) Honours in the Bachelor of Science is available to meritorious candidates who complete an additional year of full time study, after the completion of the pass degree. Part time study over two years may be permitted if the Faculty is satisfied the candidate cannot undertake honours full time. Admission, requirements and award of honours are according to the Resolutions of the Faculty of Science.

(2) Candidates for the Bachelor of Science (Honours) must suspend their candidature in the Bachelor of Engineering.

On completion of the requirements of the Bachelor of Science (Honours) degree, candidates will be eligible to resume their enrolment toward the Bachelor of Engineering degree according the Faculty of Engineering and Information Technologies course resolutions for the degree. Alternatively, honours in the Bachelor of Science may be undertaken after successful completion of both the Bachelor of Science and Bachelor of Engineering degrees.

(3) Admission and award requirements for honours in the Bachelor of Engineering are listed in the resolution for the Bachelor of Engineering degree.

10 Award of the degree

(1) Candidates will be awarded a separate testamur for the Bachelor of Science and the Bachelor of Engineering.

(2) The Bachelor of Science is awarded with the grade 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.

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

11 Course transfer

Candidates may abandon the Bachelor of Science degree at any stage and resume their enrolment in the Bachelor of Engineering. Completion of the Bachelor of Science 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 persons who commenced their candidature after 1 January, 2011 and persons 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.

Bachelor of Information Technology 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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH047	Bachelor of Information Technology and Bachelor of Arts

2 Attendance pattern

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

3 Streams

(1) Completion of a stream is a requirement of the Bachelor of Information Technology. The streams available and requirements are outlined in the resolutions for the Bachelor of Information Technology.
(2) Candidates wishing to transfer between streams should contact the Faculty student office.

4 Cross-faculty management

(1) Candidates in this combined degree program will be under the general supervision of the Faculty of Engineering and Information Technologies for the duration of the combined program.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Arts 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 Bachelor of Information Technology are set out in the Bachelor of Information Technology units of study table.
(2) The units of study that may be taken for the Bachelor of Arts are set out in Table A from the Faculty of Arts Tables of units of study.
(3) To qualify for the award of the combined Bachelor of Information Technology and Bachelor of Arts degree, a candidate must successfully complete a total of 240 credit points.
(4) For the Bachelor of Information Technology a candidate must complete 144 credit points of core and 12 credit points of elective units selected from the table of units for the Bachelor of Information Technology stream the candidate is pursuing.
(5) For the Bachelor of Arts a candidate must complete a total of 84 credit points from Table A, including:
    (a) a major from Table A;
    (b) a minimum 54 credit points of 2000/3000 level units of study.

7 Majors

Completion of a Table A major is a requirement for the Bachelor of Arts. The majors available and requirements are outlined in the resolutions of the Faculty of Arts.

8 Requirements for the Honours degree

(1) Honours is available to meritorious candidates, in either or both the Bachelor of Information Technology or the Bachelor of Arts. Honours requires the completion an alternative set of units in the final year of the Bachelor of Information Technology degree and of one additional full time year of study for the Bachelor of Arts degree. The Bachelor of Arts Honours program may be completed part time over two years with permission of the administering department or program.
(2) Admission and award requirements for honours in the Bachelor of Information Technology are listed in the resolution for the Bachelor of Information Technology degree. Admission and award requirements for honours in the Bachelor of Arts are listed in the resolutions of the Faculty of Arts.

9 Award of the degrees

(1) Candidates will be awarded a separate testamur for each degree completed.
(2) The Bachelor of Information Technology and the Bachelor of Arts are awarded in the grade of either Pass or Honours. The honours degrees are awarded in classes ranging from First Class to Third Class according to the rules specified in the course resolutions for the Bachelor of Information Technology and the Resolutions of the Faculty of Arts.
(3) Candidates who do not meet the requirements for the award of the Bachelor of Information Technology (Honours) but who have otherwise satisfied the requirements of the Bachelor of Information Technology shall graduate with the pass degree.
(4) Candidates for the award of the Bachelor of Arts (Honours) who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

10 Course transfer

A candidate may abandon the combined program and elect to complete either the Bachelor of Information Technology or the Bachelor of Arts 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.

11 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.

Bachelor of Information Technology and Bachelor of Commerce

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH042	Bachelor of Information Technology and Bachelor of Commerce

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) Completion of a stream is a requirement of the Bachelor of Information Technology. The streams available and requirements are outlined in the resolutions for the Bachelor of Information Technology.
(2) Candidates wishing to transfer between streams should contact the Faculty student office.

4 Cross faculty management

(1) Candidates in this combined degree program will be under the general supervision of the Faculty of Engineering and Information Technologies for the duration of the combined program.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Economics and Business 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 Bachelor of Information Technology are set out in the Bachelor of Information Technology units of study table.
(2) The units of study that may be taken for the Bachelor of Commerce are set out in the Table of undergraduate units of study from the Faculty of Economics and Business.
(3) To qualify for the award of the combined degree, a candidate must successfully complete 240 credit points.
(4) For the Bachelor of Information Technology a candidate must complete 144 credit points of core units selected from the table of units for the Bachelor of Information Technology stream the candidate is pursuing.
(5) For the Bachelor of Commerce a candidate must complete 96 credit points selected from the Table of undergraduate units of study from the Faculty of Economics and Business including:
    (a) 36 credit points of core units of study (30 junior credit points and six senior credit points); and
    (b) a major; and
    (c) at least 48 credit points at 2000 and/or 3000 levels.

7 Majors

Completion of a major is a requirement for the Bachelor of Commerce. The majors available and requirements are outlined in the resolutions for the Bachelor of Commerce.

8 Requirements for the Honours degree

(1) Honours is available to meritorious candidates, in either or both the Bachelor of Information Technology or the Bachelor of Commerce. Honours requires the completion an alternative set of units in the final year of the Bachelor of Information Technology degree and of one additional full time year of study for the Bachelor of Commerce degree. The Bachelor of Commerce Honours program may be completed part time over two years with the permission of the Faculty of Economics and Business.
(2) Admission and award requirements for honours in the Bachelor of Information Technology are listed in the course resolution for the Bachelor of Information Technology degree. Admission and award requirements for honours in the Bachelor of Commerce are listed in the resolutions of the Faculty of Economics and Business.

9 Award of the degrees

(1) Candidates will be awarded a separate testamur for each degree completed.
(2) The Bachelor of Information Technology and the Bachelor of Commerce are awarded in the grades of either Pass or Honours. The honours degrees are awarded in classes ranging from First Class to Third Class according to the rules specified in the Resolutions of the Faculty of Engineering and Information Technologies and the Faculty of Economics and Business.
(3) Candidates who do not meet the requirements for the award of the Bachelor of Information Technology (Honours) but who have otherwise satisfied the requirements of the Bachelor of Information Technology shall graduate with the pass degree.
(4) Candidates for the award of the Bachelor of Commerce (Honours) who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

10 Course transfer

A candidate may abandon the combined program and elect to complete either the Bachelor of Engineering or the Bachelor of Commerce in accordance with the resolutions governing that degree. Transfer from a combined degree to the Bachelor of Commerce is also conditional on the student having met the entry requirements of the Bachelor of Commerce in force at the time of their enrolment in the combined 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.

11 Transitional provisions

(1) These resolutions apply to candidates who commenced their candidature after 1 January, 2011 and candidates 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.

Bachelor of Information Technology 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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH051	Bachelor of Information Technology and Bachelor of Laws

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) Completion of a stream is a requirement of the Bachelor of Information Technology in this combined degree. The streams available are:
  (a) Computer Science
  (b) Information Systems
(2) The table of units for the Bachelor of Information Technology specifies the units required for each stream.

4 Cross-faculty management

(1) Candidates in this combined degree program will be under the general supervision of the Faculty of Engineering and Information Technologies until the end of the semester in which they complete the requirements for the Bachelor of Information Technology. They will then be under the supervision of the Faculty of Law.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Law 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 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 this combined degree are set out in the Bachelor of Information Technology units of study table and in the Faculty of Law Undergraduate Table.
(2) To qualify for the award of the pass degrees in the combined program, a candidate must complete 288 credit points, comprising:
  (a) 144 credit points of Law units of study, of which 48 credit points are Combined Law compulsory units of study for years 1, 2 and 3 and are credited towards the requirements for both the Bachelor of Information Technology and the Bachelor of Laws; and
  (b) 144 credit points of core units of study from the table of units for the Bachelor of Information Technology, appropriate to the stream the candidate is pursuing.
(3) *Requirements for the Bachelor of Information Technology*: To qualify for the award of the Bachelor of Information Technology, a candidate must complete 192 credit points comprising:
  (a) 48 credit points of Combined Law compulsory units of study for Years 1, 2 and 3;
  (b) 144 credit points of core units of study from the table of units for the Bachelor of Information Technology, appropriate to the stream the candidate is pursuing, ensuring:
    (i) no more than 72 credit points of junior (1000 level) units of study, and
    (ii) at least 84 credit points of 3000-level or above units of study; and
    (iii) at least 18 credit points of Mathematics and Statistics units of study, of which at least six credit points must be 2000 level or above.
(4) *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 Faculty of Law Undergraduate Table, comprising:
    (i) 102 credit points of compulsory units of study; and
    (ii) 42 credit points of elective units of study, of which a maximum of 36 credit points are taken from Part 1 and a minimum of 6 credit points are taken from Part 2.

7 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 the Bachelor of Laws units of study in the order listed in the Faculty of Law Undergraduate Table.
(3) Except with the permission of the Dean of the Faculty of Law, candidates must complete the requirements for the Bachelor of Information Technology before proceeding to Year Five of the Bachelor of Laws.

8 Requirements for the Honours degree

(1) Both the Bachelor of Information Technology and the Bachelor of Laws may be awarded with honours.
(2) Honours in the Bachelor of Information Technology is available to meritorious students who complete an alternative set of units in the final year of the program.
(3) 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 program.
(4) The admission and award requirements for honours in either Information Technology or Law are listed in the resolutions of the Bachelor of Information Technology and Bachelor of Laws respectively.

9 Award of the degrees

(1) The Bachelor of Information Technology and Bachelor of Laws are awarded in the grades of either Pass or Honours.
(2) Honours in the Bachelor of Information Technology is awarded in classes ranging from First Class to Third Class in accordance with the resolutions of the Bachelor of Information Technology.
(3) Honours in the Bachelor of Laws is awarded in First Class or Second Class in accordance with the resolutions of the Bachelor of Laws.

10 Course transfer

A candidate may withdraw from the combined program and elect to transfer to the Bachelor of Information Technology, by written application to the Faculty of Engineering and Information Technologies, 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.

11 Transitional provisions

(1) These resolutions apply to students who commenced their candidature on or after 1 January, 2011.
(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.

Bachelor of Information Technology and Bachelor of Medical Science

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH048	Bachelor of Information Technology and Bachelor of Medical Science

2 Attendance pattern

The attendance pattern for this course is available in full time or part time.

3 Streams

Completion of a stream is a requirement for the Bachelor of Information Technology. The streams available and requirements are outlined in the resolutions for the Bachelor of Information Technology.

4 Cross faculty management

(1) Candidates in this combined degree program will be under the general supervision of the Faculty of Engineering and Information Technologies for the duration of the combined program.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Science 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 Progression rules

General progression rules for the combined degree are covered by the resolutions of the Faculty of Engineering and Information Technologies.

7 Requirements for award

(1) The units of study that may be taken for the Bachelor of Information Technology are set out in the Bachelor of Information Technology units of study table.
(2) The units of study that may be taken for the Bachelor of Medical Science are listed in Table IV for the Bachelor of Medical Science from the Faculty of Science.
(3) To qualify for the award of the pass degree, a candidate must successfully complete 240 credit points.
(4) For the Bachelor of Information Technology a candidate must complete 144 credit points of Core and Selected Core units chosen from the table of units for the Bachelor of Information Technology stream the candidate is pursuing, noting that:
    (a) The mathematics requirement for this degree will also satisfy the mathematics requirements for the Bachelor of Medical Science; and
    (b) 12 credit points of Senior units from the Bachelor of Medical Science will count to the Selected Core units at 3000 level and above of the Bachelor of Information Technology.
(5) For the Bachelor of Medical Science a candidate must complete 120 credit points of units comprising:
    (a) a minimum 48 credit points from junior Science units of study, including:
        (i) MBLG1001/1901 Introductory Molecular Biology & Genetics; and
        (ii) six credit points of Biology; and
        (iii) 12 credit points each from Mathematics, Chemistry, and either Physics or Computational Science;
    (b) 48 credit points of intermediate core units of study listed in Table IV for the Bachelor of Medical Science; and
    (c) 24 credit points of senior Science units of study selected from the subject areas of Anatomy/Histology, Biology (Genetics), Biochemistry, Cell Pathology, Immunology, Infectious Diseases, Microbiology, Pharmacology and/or Physiology.

8 Requirements for the Honours degree

(1) Honours is available to meritorious candidates, in either or both the Bachelor of Information Technology or Bachelor of Medical Science. Honours requires the completion an alternative set of units in the final year of the Bachelor of Information Technology degree and of one additional full time year of study for the Bachelor of Medical Science degree. The Resolutions of the Faculty of Science allow for part time honours in certain circumstances.
(2) Admission and award requirements for honours in the Bachelor of Information Technology are listed in the resolution for the Bachelor of Information Technology degree. Admission and award requirements for honours in the Bachelor of Medical Science are listed in the resolutions of the Faculty of Science.

9 Award of the degrees

(1) Candidates will be awarded a separate testamur for each degree completed.
(2) The Bachelor of Information Technology and the Bachelor of Medical Science are awarded in the grades of either Pass or Honours. The honours degrees are awarded in classes ranging from First Class to Third Class according to the rules specified in the Resolutions of the Faculty of Engineering and Information Technologies and Faculty of Science.
(3) Candidates who do not meet the requirements for the award of the Bachelor of Information Technology (Honours) but who have otherwise satisfied the requirements of the Bachelor of Information Technology shall graduate with the pass degree.
(4) Candidates for the award of the Bachelor of Medical Science (Honours) who do not meet the requirements, and who have not already graduated, will be awarded the pass degree.

10 Course transfer

A candidate may abandon the combined program and elect to complete either the Bachelor of Informational Technology or the Bachelor of Medical 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.

11 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.

Bachelor of Information Technology and Bachelor of Science

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended) and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HH049	Bachelor of Information Technology and Bachelor of Science

2 Attendance pattern

The attendance pattern for this course is full time only.

3 Streams

(1) Completion of a stream is a requirement of the Bachelor of Information Technology. The streams available and requirements are outlined in the resolutions for the Bachelor of Information Technology.
(2) The Bachelor of Science degree is available in the following streams:
  (a) Advanced
  (b) Advanced Mathematics.
(3) Completion of a stream is not a requirement of the Bachelor of Science. Candidates wishing to transfer between streams should contact the Faculty student office.

4 Cross faculty management

(1) Candidates in this combined degree program will be under the general supervision of the Faculty of Engineering and Information Technologies for the duration of the combined program.
(2) The Deans of the Faculty of Engineering and Information Technologies and the Faculty of Science 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 Bachelor of Information Technology are set out in the Bachelor of Information Technology units of study table.
(2) The units of study that may be taken for the Bachelor of Science are listed in Table 1 from the Faculty of Science.
(3) To qualify for the award of the combined degree, a candidate must successfully complete 240 credit points, comprising:
  (a) units of study from the table of units for the Bachelor of Information Technology stream the candidate is pursuing, and ensuring:
    (i) no more than 72 credit points in junior (1000 level) units of study;
    (ii) at least 84 credit points in 3000-level or above units of study; and
  (b) a minimum of 96 credit points Science units of study, including at least 18 credit points of Mathematics and Statistics units of study; and
  (c) a major in a Science area listed in Table 1 excluding Computer Science and Information Systems;
  (d) and ensuring at least 54 credit points in the intermediate and senior Science units of study.
(4) Candidates completing the Bachelor of Science in the Advanced or the Advanced Mathematics stream must include as part of the above requirements:
  (a) a minimum of 54 credit points of intermediate or senior Science units of study, of which at least 36 credit points at either the Advanced level or as Talented Student Program (TSP) units of study; and
  (b) a minimum of 24 credit points of senior Science units of study at either the Advanced level or as TSP units in a single Science subject area; and
  (c) a minimum of 66 credit points from the intermediate and senior Science units of study.
(5) Candidates completing the Bachelor of Science in the Advanced Mathematics stream must include as part of the above requirements a minimum of 48 credit points of senior units of study in Mathematics and Statistics, including at least 24 credit points of units of study at the Advanced level or as TSP units of study.

7 Majors

Completion of a major is a requirement the Bachelor of Science. The majors available and requirements are outlined in the resolutions for the Bachelor of Science.

8 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) General progression rules for the combined degree are covered by the resolutions of the Faculty of Engineering and Information Technologies.

9 Requirements for the Honours degree

(1) Honours is available to meritorious candidates, in either or both the Bachelor of Information Technology or the Bachelor of Science. Honours requires the completion of an alternative set of units in the final year of the Bachelor of Information Technology degree and of one additional full time year of study for the Bachelor of Science degree. The Resolutions of the Faculty of Science allow for part time honours in certain circumstances.
(2) Admission and award requirements for honours in the Bachelor of Information Technology are listed in the resolution for the Bachelor of Information Technology degree. Admission and award requirements for honours in the Bachelor of Science are listed in the resolutions of the Faculty of Science.

10 Award of the degree

(1) Candidates will be awarded a separate testamur for each degree completed.
(2) The Bachelor of Information Technology and the Bachelor of Science are awarded in the grades of either Pass or Honours. The honours degrees are awarded in classes ranging from First Class to Third Class according to the rules specified in the Resolutions of the Faculty of Engineering and Information Technologies and Faculty of Science.
(3) Candidates who do not meet the requirements for the award of the Bachelor of Information Technology (Honours) but who have otherwise satisfied the requirements of the Bachelor of Information Technology shall graduate with the pass degree.
(4) Candidates for the award of the Bachelor of Science (Honours) who do not meet the requirements, and who have not already graduated, will be awarded the pass degree merited.

11 Course transfer

A candidate may abandon the combined program and elect to complete the either the Bachelor of Information Technology 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 persons who commenced their candidature after 1 January, 2011 and persons 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.

5. Engineering and Information Technologies stream requirements

The tables in this section give the detailed program requirements for each of the streams of Engineering and Information Technologies. Core, recommended elective and related requirements must be met in order to graduate in a particular stream of Engineering or Information Technology.

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Flexible First Year			
Students wishing to proceed to the degrees of Bachelor of Information Technology, Bachelor of Computer Science and Technology, Bachelor of Engineering or combined degrees with Science, Arts, Commerce, Law or Medical Science may choose to enrol in one of the two options of the Flexible First Year program. For details on eligibility for entry to this program and second year stream entry requirements consult the Faculty resolutions pertaining to Flexible First Year.			
Students must decide on the stream of Engineering or Information Technologies to persue, once they have completed the Flexible First Year program.			
Students will not need to decide their choice of Engineering or IT specialisation until the end of their first semester or the end of their first year, depending on their stream of choice.			
Core units of study for Stream A specialisations			
Core units of study for Stream A specialisations in the Engineering areas of Aeronautical, Aeronautical(Space), Biomedical, Chemical, Civil, Mechanical, Mechanical(Space) or Project Management can elect to choose this option.			
First year			
ENGG1800 **Engineering Disciplines (Intro)** **Stream A**	6		Semester 1
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
ENGG1803 **Professional Engineering 1**	6		Semester 1 Semester 2
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics **C** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) **N** PHYS1002, PHYS1901, EDUH1017	Semester 1
Students wishing to proceed into the stream of Chemical should replace PHYS1001 with CHEM1101 Chemistry 1A as an alternate core unit. Students wishing to proceed into the stream of Mechanical(Biomedical) Engineering should replace PHYS1001 with BIOL1001 as an alternate core unit.			
Alternate units of study			
Most units of study offered by the Science Faculty shown in the tables can be replaced by an equivalent advanced level unit, subject to prerequisite conditions (as required by the Faculty of Science) being met. Students considering doing advanced options should seek advice from their school before enrolling.			
Elective unit of study			
In addition, a 6 credit point junior level unit of study must be choosen to complete the second semester enrolment. This is a free choice elective unit subject only to enrolment restrictions imposed by faculties on some specific junior level units.			
Notes			
1. Students wishing to proceed to the degree of Bachelor of Engineering in Chemical and Biomolecular Engineering should complete the first semester of this program and enrol in their chosen specialisation in Semester 2.			
2. It is strongly advised that before choosing the second semester elective, students consult the requirements for the specialisation that they plan to enter as an appropriate choice of elective will help with core progression and prerequisite requirements for many areas.			
Core units of study for Stream B specialisations			
Core units of study for Stream B specialisations in the Engineering areas of Electrical, Electrical(Computer), Electrical (Power), Electrical(Bioelectronics), Electrical(Telecommunications), Mechatronics, Mechatronics (Space), Software and Bachelor of Information Technology or Bachelor of Computer Science and Technology can elect to choose this option.			
First year			
ENGG1805 **Professional Engineering and IT**	6		Semester 1
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
Student wishing to proceed into the Engineering stream of Mechatronics or Mechatronics(Space) should replace INFO1103 with ENGG1801 an alternate core unit.			

Alternate units of study

Most units of study offered by the Science Faculty or the School of IT shown in the tables can be replaced by an equivalent advanced level unit, subject to prerequisite conditions being met. Students considering doing advanced options should seek advice from their school before enrolling.

Notes

1. Students in this option will choose their specialisation at the end of Semester 1 and continue in the specialist program or IT degree in Semester 2.

5.1 School of Aerospace, Mechanical and Mechatronic Engineering

The School of Aerospace, Mechanical and Mechatronic Engineering offers the following Bachelor of Engineering degree streams:

- Aeronautical
- Aeronautical Space
- Mechanical
- Mechanical Biomedical
- Mechanical Space
- Mechatronic
- Mechatronic Space
- Combined degrees with Science, Commerce, Arts, Medical Science and Law

Aeronautical Engineering stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Aeronautical Engineering			
Candidates for the degree of Bachelor of Aeronautical Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary shall be gained by completing additional credit points of elective units of study as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points.			
Core units of study			
First year			
AERO1560 **Introduction to Aerospace Engineering**	6	**N** MECH1560, MTRX1701, ENGG1800	Semester 1
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
ENGG1803 **Professional Engineering 1**	6		Semester 1 Semester 2
Normally taken in Semester 1, students in combined degrees are exempt from this unit.			
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
AERO1400 **Intro to Aircraft Construction & Design**	6	**A** Some basic skills with engineering workshop hand tools is desireable *Note: Department permission required for enrolment*	Semester 2
Students in combined degrees are exempt from this unit.			
AMME1550 **Dynamics 1**	6		Semester 2
PHYS1001 is an acceptable alternative for BE/BSC students.			
Second year			
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
Students in combined degrees take MATH2067 as alternative.			
AERO2703 **Aerospace Technology 1**	6	**A** ENGG1801 **P** AERO1560	Semester 1
AMME2301 **Mechanics of Solids**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (MATH1003 or MATH1903 or MATH1907), (ENGG1802 or PHYS1001 or PHYS1901)	Semester 2
AMME2500 **Engineering Dynamics**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (AMME1550 or PHYS1001 or PHYS1901)	Semester 1
BE/BSc students can enrol in PHYS2011, PHYS2012 as acceptable alternatives or advanced equivalent.			

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
MATH2065 **Partial Differential Equations (Intro)**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2005, MATH2905, MATH2965, MATH2067	Semester 2 Summer Main
MATH2067 as alternative for combined degree students.			
AMME2302 **Materials 1**	6	**N** CIVL2110	Semester 1
MECH2400 **Mechanical Design 1**	6	**A** ENGG1802,AMME2302 **C** AMME2301	Semester 2
AMME2200 **Thermodynamics and Fluids**	6	**A** MATH1001; MATH1002; MATH1003.	Semester 2
PHYS2011, PHYS2012 or advanced equivalent, are acceptable alternatives for BE/BSc students.			
Third year			
AERO3360 **Aerospace Structures 1**	6	**P** AMME2301	Semester 1
AMME3500 **System Dynamics and Control**	6	**P** AMME2500; (MATH2061 or MATH2961 or MATH2067)	Semester 1
AERO3460 **Aerospace Design 1**	6	**P** AMME2301 and MECH2400	Semester 1
AERO3660 **Aerospace Management**	6		Semester 1
Students in combined degrees are exempt from this unit.			
AERO3260 **Aerodynamics 1**	6	**P** AMME2200 and (MATH2061 or MATH2067)	Semester 2
AERO3261 **Propulsion**	6	**A** Good knowledge of fluid dynamics including gas dynamics **P** AMME2200	Semester 2
AERO3560 **Flight Mechanics 1**	6	**P** AMME2500 and (MATH2061 or MATH2067) **C** AMME3500	Semester 2
AERO3465 **Aerospace Technology 2**	6	**A** AERO1400; AMME2302 **P** AMME2301 and MECH2400	Semester 2
Students in combined degrees are exempt from this unit.			
Fourth year			
AERO4260 **Aerodynamics 2**	6	**P** AMME2200	Semester 2
Students in combined degrees are exempt from this unit.			
AERO4360 **Aerospace Structures 2**	6	**P** AERO3360	Semester 1
AERO4460 **Aerospace Design 2**	6	**A** AERO1400, AERO2703 and AERO3465 **P** AERO3260, AERO3261, AERO3360 and AERO3460	Semester 1
AERO4560 **Flight Mechanics 2**	6	**A** AMME2500 **P** AERO3560 and AMME3500	Semester 1
ENGG4000 **Practical Experience**		**P** 36 Credit Points of Senior Units *Students should have completed three years of their BE program before enrolling in this unit.*	Semester 1 Semester 2
Students must select 12cp from the following block of units.			
Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
AMME4111 **Honours Thesis A** Normally taken in Semester 1	6	**P** 36 credit points of senior units of study and 2nd/3rd year WAM of 65% or greater **C** AMME4112 **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
AMME4112 **Honours Thesis B** Normally taken in Semester 2	6	**P** AMME4111 Honours Thesis A **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
AMME4121 **Engineering Project A** Normally taken in Semester 1	6	**P** 36 credit points of senior units of study. **C** AMME4122 **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
AMME4122 **Engineering Project B** Normally taken in Semester 2	6	**P** AMME4121 Engineering Project A **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Acceptable alternative units of study			
Students in the Honours program must enrol in AMME4111 & AMME4112, students in the Pass program must enrol in AMME4121 & AMME4122.			
BE/BSc students can enrol in PHYS2011, PHYS2012 or advanced equivalent, as acceptable alternative to AMME2200 & AMME2500.			
Most units of study offered by the Science Faculty shown in the tables can be replaced by an equivalent advanced level unit, subject to prerequisite conditions (as required by the Faculty of Science) being met. Students considering doing advanced options should seek advice from their department before enrolling.			
Students undertaking Study Abroad in a particular year of their degree must enrol in the appropriate International Exchange Program units of study as an alternative to a semester's standard units.			

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Resolutions of the Faculty of Engineering relating to this table:			
BE(Aeronautical)			
In addition to gaining credit for the units of study set out in this table, candidates are required to complete 12 credits points of free elective units of study. A minimum of 192 credit points is required to be eligible for the award of the degree of BE(Aeronautical).			
BE(Aeronautical)/BSc or BCom or BMedSc			
In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc or BE/BMedSc; or the Faculty of Economics and Business for the BE/BCom. A minimum of 240 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.			
BE(Aeronautical)/BA			
In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 84 credit points of units of study given by the Faculty of Arts for the BE/BA and 12 credit points from the table of recommended elective units of study for Aeronautical Engineering. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.			
BE(Aeronautical)/LLB			
In addition to gaining credit for the core units of study set out in this table, candidates are required to complete at least 144 credit points of units of study given by the Faculty of Law for the BE/LLB. A minimum of 288 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and IT and the Faculty of Law.			
Recommended elective units of study			
AERO4206 **Rotary Wing Aircraft**	6	**A** Prior Learning : concepts from 3rd Year Aerodynamics and Flight Mechanics will be applied to Rotary Wing Vehicles in this unit. **P** AERO3260 and AERO3560	Semester 2
AMME4210 **Computational Fluid Dynamics**	6	**A** Partial differental equations, finite difference methods, linear algebra, matrix methods, pressure, force, acceleration, continuity, streamline and streamfunction, viscosity, control parameters, non-dimensionalisation. **P** MECH3261 or AERO3260 *Note: Department permission required for enrolment*	Semester 1
AERO4491 **Advanced Aircraft Design**	6	**A** AERO1400, AERO2703, AERO3260, AERO3261, AERO3360, AERO3465 and AERO3560 **P** MECH2400 and AERO3460	Semester 2
AMME4500 **Guidance and Control**	6	**P** AMME3500.	Semester 2
AERO4591 **Advanced Flight Mechanics**	6	**P** AERO3560 and AMME3500 *Note: Department permission required for enrolment*	Semester 2
Notes			
1. Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.			
2. Units of study not included in this table may also be selected subject to the approval of the Head of School Aerospace, Mechanical and Mechatronic Engineering.			

Aeronautical (Space) Engineering stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Aeronautical (Space) Engineering			
Candidates for the degree of Bachelor of Aeronautical (Space) Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary shall be gained by completing additional credit points of elective units of study as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points.			
Core units of study			
First year			
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
AERO1560 **Introduction to Aerospace Engineering**	6	**N** MECH1560, MTRX1701, ENGG1800	Semester 1
ENGG1803 **Professional Engineering 1**	6		Semester 1 Semester 2
Normally taken in Semester 1. Students in combined degrees are exempt.			
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
AMME1550 **Dynamics 1**	6		Semester 2
PHYS1001 is an acceptable alternative for BE/BSc students.			
AERO1400 **Intro to Aircraft Construction & Design**	6	**A** Some basic skills with engineering workshop hand tools is desireable *Note: Department permission required for enrolment*	Semester 2
Students in combined degrees are exempt.			
Second year			
MATH2067 **DEs and Vector Calculus for Engineers**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2005, MATH2905, MATH2061, MATH2961, MATH2065, MATH2965	Semester 1
AMME2301 **Mechanics of Solids**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (MATH1003 or MATH1903 or MATH1907), (ENGG1802 or PHYS1001 or PHYS1901)	Semester 2
AMME2500 **Engineering Dynamics**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (AMME1550 or PHYS1001 or PHYS1901)	Semester 1
BE/BSc students can enrol in PHYS2011, PHYS2012, or advanced equivalent, as acceptable alternative.			
AMME2200 **Thermodynamics and Fluids**	6	**A** MATH1001; MATH1002; MATH1003.	Semester 2
BE/BSc students can enrol in PHYS2011, PHYS2012, or advanced equivalent, as acceptable alternative.			
ELEC2004 **Electrical Engineering: Foundations**	6	**N** ELEC1103, ELEC1601	Semester 1
Students in combined degrees are exempt from this unit.			
AMME2302 **Materials 1**	6	**N** CIVL2110	Semester 1
MECH2400 **Mechanical Design 1**	6	**A** ENGG1802,AMME2302 **C** AMME2301	Semester 2
AERO2705 **Space Engineering 1**	6	**A** ENGG1801 **P** AERO1560 (or MECH1560 or MTRX1701), MATH1001, MATH1002, MATH1003)	Semester 2
Third year			
AERO3260 **Aerodynamics 1**	6	**P** AMME2200 and (MATH2061 or MATH2067)	Semester 2
AERO3360 **Aerospace Structures 1**	6	**P** AMME2301	Semester 1
AERO3460 **Aerospace Design 1**	6	**P** AMME2301 and MECH2400	Semester 1
AMME3500 **System Dynamics and Control**	6	**P** AMME2500; (MATH2061 or MATH2961 or MATH2067)	Semester 1
AERO3560 **Flight Mechanics 1**	6	**P** AMME2500 and (MATH2061 or MATH2067) **C** AMME3500	Semester 2
AERO3760 **Space Engineering 2**	6	**P** AERO2705	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
AERO3660 **Aerospace Management**	6		Semester 1
Students in combined degrees are exempt from this unit.			
AERO3261 **Propulsion**	6	**A** Good knowledge of fluid dynamics including gas dynamics **P** AMME2200	Semester 2
Students in combined degrees are exempt from this unit.			
Fourth year			
AERO4360 **Aerospace Structures 2**	6	**P** AERO3360	Semester 1
AERO4701 **Space Engineering 3**	6	**P** AERO3760	Semester 1
AERO4560 **Flight Mechanics 2**	6	**A** AMME2500 **P** AERO3560 and AMME3500	Semester 1
ENGG4000 **Practical Experience**		**P** 36 Credit Points of Senior Units *Students should have completed three years of their BE program before enrolling in this unit.*	Semester 1 Semester 2
AERO4260 **Aerodynamics 2**	6	**P** AMME2200	Semester 2
Students in combined degrees are exempt.			
Students must select 12cp from the following block of units.			
Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
AMME4111 **Honours Thesis A**	6	**P** 36 credit points of senior units of study and 2nd/3rd year WAM of 65% or greater **C** AMME4112 **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 1			
AMME4112 **Honours Thesis B**	6	**P** AMME4111 Honours Thesis A **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 2			
AMME4121 **Engineering Project A**	6	**P** 36 credit points of senior units of study. **C** AMME4122 **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semester 1.			
AMME4122 **Engineering Project B**	6	**P** AMME4121 Engineering Project A **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semester 2			

Acceptable alternative units of study

Students in the Honours program must enrol in AMME4111 & AMME4112, students in the Pass program must enrol in AMME4121 & AMME4122.

BE/BSc students can enrol in PHYS2011, PHYS2012, or advanced equivalent, as acceptable alternative to AMME2200 & AMME2500.

Most units of study offered by the Science Faculty shown in the tables can be replaced by an equivalent advanced level unit, subject to prerequisite conditions (as required by the Faculty of Science) being met.

Students undertaking Study Abroad in a particular year of their degree must enrol in the appropriate Aerospace International Exchange Program units of study as an alternative to a semester's standard units.

Resolutions of the Faculty of Engineering relating to this table:

BE(Aeronautical Engineering)(Space)

In addition to gaining credit for the units of study set out in the above table, candidates are required to complete 12 credit points from either the table of recommended units of study for Aeronautical (Space) Engineering or from free elective units of study. A minimum of 192 credit points is required to be eligible for the award of BE(Aeronautical)(Space).

BE(Aeronautical Engineering)(Space)/BSc or BMedSc or BCom

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc or BE/BMedSc; or the Faculty of Economics and Business for the BE/BCom. A minimum of 240 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.

BE(Aeronautical Engineering)(Space)/BA

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 84 credit points of units of study given by the Faculty of Arts for the BE/BA and 12 credit points from the table of recommended elective units of study for Aeronautical (Space) Engineering. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.

BE(Aeronautical Engineering)(Space)/LLB

In addition to gaining credit for the core units of study set out in this table, candidates are required to complete at least 144 credit points of units of study given by the Faculty of Law for the BE/LLB. A minimum of 288 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and IT and the Faculty of Law.

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Recommended elective units of study			
AMME4210 **Computational Fluid Dynamics**	6	**A** Partial differental equations, finite difference methods, linear algebra, matrix methods, pressure, force, acceleration, continuity, streamline and streamfunction, viscosity, control parameters, non-dimensionalisation. **P** MECH3261 or AERO3260 *Note: Department permission required for enrolment*	Semester 1
AMME4500 **Guidance and Control**	6	**P** AMME3500.	Semester 2
AMME4700 **Inertial Navigation & the Kalman Filter** *This unit of study is not available in 2011*	6	**P** AERO4701 or MECH4720 or MECH4730 or MTRX4700 or AERO4560. *Note: Department permission required for enrolment*	Semester 2
AERO4591 **Advanced Flight Mechanics**	6	**P** AERO3560 and AMME3500 *Note: Department permission required for enrolment*	Semester 2

Notes

1. Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.

2. Units of study not included in this table may also be selected subject to the approval of the Head of School Aerospace, Mechanical and Mechatronic Engineering.

Mechanical Engineering stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Mechanical Engineering			
Candidates for the degree of Bachelor of Mechanical Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary shall be gained by completing additional credit points of elective units of study as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points.			
Core units of study			
First year			
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
ENGG1803 **Professional Engineering 1**	6		Semester 1 Semester 2
Normally taken in Semester 1, students in combined degrees are exempt from this unit.			
MECH1560 **Introduction to Mechanical Engineering**	6	**N** AERO1560, MTRX1701, ENGG1800 *Note: Department permission required for enrolment*	Semester 1
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
AMME1550 **Dynamics 1**	6		Semester 2
PHYS1001, Physics 1 Regular is an acceptable alternatve for BE/BSc students.			
MECH1400 **Mechanical Construction**	6	*Note: Department permission required for enrolment*	Semester 2
Students in combined degrees are exempt from this unit.			
Second year			
ELEC2004 **Electrical Engineering: Foundations**	6	**N** ELEC1103, ELEC1601	Semester 1
AMME2302 **Materials 1**	6	**N** CIVL2110	Semester 1
AMME2500 **Engineering Dynamics**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (AMME1550 or PHYS1001 or PHYS1901)	Semester 1
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
Combined degree students take MATH2067 as alternative.			
MATH2065 **Partial Differential Equations (Intro)**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2005, MATH2905, MATH2965, MATH2067	Semester 2 Summer Main
Combined degree students take MATH2067 as alternative.			
AMME2301 **Mechanics of Solids**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (MATH1003 or MATH1903 or MATH1907), (ENGG1802 or PHYS1001 or PHYS1901)	Semester 2
MECH2400 **Mechanical Design 1**	6	**A** ENGG1802,AMME2302 **C** AMME2301	Semester 2
AMME2200 **Thermodynamics and Fluids**	6	**A** MATH1001; MATH1002; MATH1003.	Semester 2
Third year			
MECH3361 **Mechanics of Solids 2**	6	**P** AMME2301 and AMME 2302	Semester 2
AMME3500 **System Dynamics and Control**	6	**P** AMME2500; (MATH2061 or MATH2961 or MATH2067)	Semester 1
MECH3261 **Fluid Mechanics**	6	**P** AMME2200	Semester 1
MECH3660 **Manufacturing Engineering**	6	**A** AMME2200, AMME2301, AMME2302 **P** (AERO1560 or MECH1560 or MTRX1701 or ENGG1800 or ENGG1805) and (ENGG1802 or PHYS1001 or PHYS1901)	Semester 1
MECH3661 **Engineering Management**	6	**A** It is expected that students will understand the concepts previously presented in ENGG1803 Professional Engineering. It is assumed that the students have an understanding of professional engineering issues, and are experienced in academic writing (both essays and reports), including appropriate referencing techniques, oral presentations and the project management process (particularly in group situations). Such previous knowledge will assist students in the development their awareness of the issues involved with engineering management.	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Students in combined degrees are exempt from this unit.			
MECH3460 **Mechanical Design 2**	6	**A** Properties of engineering materials including fatigue failure theories. Statics and dynamics properties of machines. Practical use of Word and Excel including the use of the `solver' and graphing capabilities built into the spreadsheet. The use of a spreadsheet is mandatory. **P** MECH2400 and AMME2301	Semester 2
MECH3362 **Materials 2**	6	**A** This subject requires you to have two important skills to bring in: (1) A good understanding of basic knowledge and principles of material science and engineering from AMME2302 Materials I and mechanics of solids for simple structural elements (in tension, bending, torsion) from AMME2301 ; (2) Reasonable mathematical skills in calculation of stresses and strains in simple structural elements. **P** AMME2301 and AMME2302	Semester 1
MECH3260 **Thermal Engineering**	6	**A** Fundamentals of thermodynamics are needed to begin this more advanced course. **P** AMME2200	Semester 2
Fourth year			
MECH4601 **Professional Engineering 2**	6	**A** MECH3661, ENGG1803, AMME4100 **P** MECH3660	Semester 1
ENGG4000 **Practical Experience**		**P** 36 Credit Points of Senior Units *Students should have completed three years of their BE program before enrolling in this unit.*	Semester 1 Semester 2
Students must select 12cp from the following block of units.			
Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
AMME4111 **Honours Thesis A**	6	**P** 36 credit points of senior units of study and 2nd/3rd year WAM of 65% or greater **C** AMME4112 **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 1			
AMME4112 **Honours Thesis B**	6	**P** AMME4111 Honours Thesis A **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 2			
AMME4121 **Engineering Project A**	6	**P** 36 credit points of senior units of study. **C** AMME4122 **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semester 1			
AMME4122 **Engineering Project B**	6	**P** AMME4121 Engineering Project A **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semester 2			

Acceptable alternative units of study

Students in the Honours program must enrol in AMME4111 & AMME4112, students in the Pass program must enrol in AMME4121 & AMME4122.

Most units of study offered by the Science Faculty shown in the tables can be replaced by an equivalent advanced level unit, subject to prerequisite conditions (as required by the Faculty of Science) being met.

Students undertaking Study Abroad in a particular year of their degree must enrol in the appropriate exchange program units of study as an alternative to a semester's standard units.

Resolutions of the Faculty of Engineering relating to this table:

BE(Mechanical Engineering)

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 18 credit points from the table of recommended elective units of study for Mechanical Engineering and 12 credit points of free elective units of study. A minimum of 192 credit points is required to be eligible for the award of the degree of BE(Mechanical).

BE(Mechanical Engineering)/BSc or BCom or BMedSci

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 6 credit points from the table of recommended elective units of study for Mechanical Engineering and at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc and BMedSci, or the Faculty of Economics and Business for the BE/BCom. A minimum of 240 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.

BE(Mechanical Engineering)/BA

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 84 credit points of units of study given by the Faculty of Arts for the BE/BA and 12 credit points from the table of recommended elective units of study for Mechanical Engineering and 6 credit points of free electives. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree

BE(Mechanical Engineering)/LLB

In addition to gaining credit for the units of study set out in this table, candidates are required to complete 6 credit points from the table of recommended elective units of study for Mechanical Engineering and at least 144 credit points of units of study given by the Faculty of Law for the BE/LLB. A minimum of 288 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.

Recommended elective units of study

AMME4210 **Computational Fluid Dynamics**	6	**A** Partial differental equations, finite difference methods, linear algebra, matrix methods, pressure, force, acceleration, continuity, streamline and streamfunction, viscosity, control parameters, non-dimensionalisation. **P** MECH3261 or AERO3260 *Note: Department permission required for enrolment*	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
AMME4241 **Renewable Energy**	6	**P** MECH3260, MECH3261	Semester 2
AMME4660 **Management, Employees and Industrial Rel**	6		Semester 2
MECH4320 **Polymer Engineering** *This unit of study is not available in 2011*	6	**P** MECH3261 and MECH3361 *Note: Department permission required for enrolment* *4th Year elective unit of study*	Semester 1
MECH4241 **Energy and the Environment**	6	**P** 24 credit points of third year units of study	Semester 1
MECH4255 **Air Conditioning and Refrigeration**	6	**P** MECH3260; MECH3261	Semester 2
MECH4265 **Combustion**	6	**A** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **P** MECH3260; MECH3261	Semester 2
MECH4310 **Advanced Engineering Materials**	6	**A** This subject requires you to have a good understanding of basic knowledge and principles of various aspects for materials engineering UoS (e.g. 2nd & 3rd year Materials I and II, 2nd year Solids 1 and 3rd year Solids 2) especially those relevant to materials engineering and technology over the past 3.5 years. **P** MECH3362	Semester 1
MECH4460 **Mechanical Design 3**	6	**A** ENGG1802, AMME2301, AMME2500, MECH3361 **P** MECH2400	Semester 1
MECH4961 **Biomechanics and Biomaterials**	6	**A** MECH3300 or MECH3362 **P** AMME2302; MECH2900 or MECH2901 **N** MECH4960	Semester 2

Notes

1. Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.

2. Units of study not included in this table may also be selected subject to the approval of the Head of School Aerospace, Mechanical and Mechatronic Engineering.

Mechanical (Space) Engineering stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Mechanical (Space) Engineering			
Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Space Engineering) are required to gain credit for the core units of study set out below. Any additional credit necessary shall be gained by completing additional credit points of elective units of study as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points.			
Core units of study			
First Year			
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
MECH1560 **Introduction to Mechanical Engineering**	6	**N** AERO1560, MTRX1701, ENGG1800 *Note: Department permission required for enrolment*	Semester 1
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
AMME1550 **Dynamics 1**	6		Semester 2
PHYS1001 is an acceptable alternative for BE/BSc students.			
ENGG1803 **Professional Engineering 1**	6		Semester 1 Semester 2
Normally taken in Semester 2, students in combined degrees are exempt.			
MECH1400 **Mechanical Construction**	6	*Note: Department permission required for enrolment*	Semester 2
Students in combined degrees are exempt.			
Second Year			
MATH2067 **DEs and Vector Calculus for Engineers**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2005, MATH2905, MATH2061, MATH2961, MATH2065, MATH2965	Semester 1
AMME2302 **Materials 1**	6	**N** CIVL2110	Semester 1
AMME2500 **Engineering Dynamics**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (AMME1550 or PHYS1001 or PHYS1901)	Semester 1
ELEC2004 **Electrical Engineering: Foundations**	6	**N** ELEC1103, ELEC1601	Semester 1
AMME2301 **Mechanics of Solids**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (MATH1003 or MATH1903 or MATH1907), (ENGG1802 or PHYS1001 or PHYS1901)	Semester 2
AERO2705 **Space Engineering 1**	6	**A** ENGG1801 **P** AERO1560 (or MECH1560 or MTRX1701), MATH1001, MATH1002, MATH1003)	Semester 2
MECH2400 **Mechanical Design 1**	6	**A** ENGG1802,AMME2302 **C** AMME2301	Semester 2
AMME2200 **Thermodynamics and Fluids**	6	**A** MATH1001; MATH1002; MATH1003.	Semester 2
Third Year			
MECH3361 **Mechanics of Solids 2**	6	**P** AMME2301 and AMME 2302	Semester 2
AMME3500 **System Dynamics and Control**	6	**P** AMME2500; (MATH2061 or MATH2961 or MATH2067)	Semester 1
MECH3660 **Manufacturing Engineering**	6	**A** AMME2200, AMME2301, AMME2302 **P** (AERO1560 or MECH1560 or MTRX1701 or ENGG1800 or ENGG1805) and (ENGG1802 or PHYS1001 or PHYS1901)	Semester 1
MECH3261 **Fluid Mechanics**	6	**P** AMME2200	Semester 1
MECH3362 **Materials 2**	6	**A** This subject requires you to have two important skills to bring in: (1) A good understanding of basic knowledge and principles of material science and engineering from AMME2302 Materials I and mechanics of solids for simple structural elements (in tension, bending, torsion) from AMME2301 ; (2) Reasonable mathematical skills in calculation of stresses and strains in simple structural elements. **P** AMME2301 and AMME2302	Semester 1
AERO3760 **Space Engineering 2**	6	**P** AERO2705	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
MECH3260 **Thermal Engineering**	6	**A** Fundamentals of thermodynamics are needed to begin this more advanced course. **P** AMME2200	Semester 2
MECH3661 **Engineering Management**	6	**A** It is expected that students will understand the concepts previously presented in ENGG1803 Professional Engineering. It is assumed that the students have an understanding of professional engineering issues, and are experienced in academic writing (both essays and reports), including appropriate referencing techniques, oral presentations and the project management process (particularly in group situations). Such previous knowledge will assist students in the development their awareness of the issues involved with engineering management.	Semester 2
Combined degree students are exempt from this unit.			
Fourth Year			
MECH4601 **Professional Engineering 2**	6	**A** MECH3661, ENGG1803, AMME4100 **P** MECH3660	Semester 1
AERO4701 **Space Engineering 3**	6	**P** AERO3760	Semester 1
ENGG4000 **Practical Experience**		**P** 36 Credit Points of Senior Units *Students should have completed three years of their BE program before enrolling in this unit.*	Semester 1 Semester 2
Students must select 12cp from the following block of units.			
Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
AMME4111 **Honours Thesis A**	6	**P** 36 credit points of senior units of study and 2nd/3rd year WAM of 65% or greater **C** AMME4112 **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 1			
AMME4112 **Honours Thesis B**	6	**P** AMME4111 Honours Thesis A **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 2.			
AMME4121 **Engineering Project A**	6	**P** 36 credit points of senior units of study. **C** AMME4122 **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semester 1.			
AMME4122 **Engineering Project B**	6	**P** AMME4121 Engineering Project A **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semster 2			

Acceptable alternative units of study

Students in the Honours program must enrol in AMME4111 & AMME4112, students in the Pass program must enrol in AMME4121 & AMME4122.

Most units of study offered by the Science Faculty shown in the tables can be replaced by an equivalent advanced level unit, subject to prerequisite conditions (as required by the Faculty of Science) being met. Students considering doing advanced options should seek advice from their department before enrolling.

Students enrolled in combined degrees are also exempt from one of the follwing core units MECH3260, MECH3261, MECH3361 or MECH3362. This choice should be based on the prereq requirements of 4th year recommended units that students plan to enrol in.

Students undertaking Study Abroad in a particular year of their degree must enrol in the appropriate International Exchange Program units of study as an alternative to a semester's standard units.

Resolutions of the Faculty of Engineering relating to this table:

BE(Mechanical Engineering)(Space)

In addition to gaining credit for the units of study set out in the above table, candidates are required to complete 12 credit points from the table of recommended elective units of study for Mechanical (Space) Engineering and 12 credit points of free elective units of study. A minimum of 192 credit points is required to be eligible for the award of BE(Mechanical)(Space).

BE(Mechanical Engineering)(Space)/BSc or BCom or BMedSci

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc and BMedSci, or the Faculty of Economics and Business for the BE/BCom. A minimum of 240 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.

BE(Mechanical Engineering)(Space)/BA

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 84 credit points of units of study given by the Faculty of Arts for the BE/BA and 12 credit points from the table of recommended elective units of study for Mechanical (Space) Engineering. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.

BE(Mechanical Engineering)(Space)/LLB

In addition to gaining credit for the core units of study set out in this table, candidates are required to complete at least 144 credit points of units of study given by the Faculty of Law for the BE/LLB. A minimum of 288 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and IT and the Faculty of Law.

Recommended elective units of study

AMME4210 **Computational Fluid Dynamics**	6	**A** Partial differental equations, finite difference methods, linear algebra, matrix methods, pressure, force, acceleration, continuity, streamline and streamfunction, viscosity, control parameters, non-dimensionalisation. **P** MECH3261 or AERO3260 *Note: Department permission required for enrolment*	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
AMME4241 **Renewable Energy**	6	**P** MECH3260, MECH3261	Semester 2
AMME4660 **Management, Employees and Industrial Rel**	6		Semester 2
MECH4241 **Energy and the Environment**	6	**P** 24 credit points of third year units of study	Semester 1
MECH4255 **Air Conditioning and Refrigeration**	6	**P** MECH3260; MECH3261	Semester 2
MECH4265 **Combustion**	6	**A** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **P** MECH3260; MECH3261	Semester 2
MECH4310 **Advanced Engineering Materials**	6	**A** This subject requires you to have a good understanding of basic knowledge and principles of various aspects for materials engineering UoS (e.g. 2nd & 3rd year Materials I and II, 2nd year Solids 1 and 3rd year Solids 2) especially those relevant to materials engineering and technology over the past 3.5 years. **P** MECH3362	Semester 1
MECH4460 **Mechanical Design 3**	6	**A** ENGG1802, AMME2301, AMME2500, MECH3361 **P** MECH2400	Semester 1
MECH4961 **Biomechanics and Biomaterials**	6	**A** MECH3300 or MECH3362 **P** AMME2302; MECH2900 or MECH2901 **N** MECH4960	Semester 2

Notes

1. Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.

2. Units of study not included in this table may also be selected subject to the approval of the Head of School Aerospace, Mechanical and Mechatronic Engineering

Mechatronic Engineering stream requirements

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Mechatronic Engineering			
Candidates for the degree of Bachelor of Engineering in Mechatronic Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary shall be gained by completing additional credit points of elective units of study as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points.			
Core units of study			
First year			
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MTRX1701 **Mechatronics Engineering Introductory**	6	**N** AERO1560, MECH1560, ENGG1800 *Note: Department permission required for enrolment*	Semester 1
MTRX1702 **Mechatronics 1**	6	**N** ELEC1101, ELEC2602, COSC1902, COSC1002	Semester 2
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
INFO1103 is an acceptable alternative.			
AMME1550 **Dynamics 1**	6		Semester 2
PHYS1001 is an acceptable alternative for BSc physics majors.			
Second year			
AMME2302 **Materials 1**	6	**N** CIVL2110	Semester 1
AMME2500 **Engineering Dynamics**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (AMME1550 or PHYS1001 or PHYS1901)	Semester 1
ELEC2104 **Electronic Devices and Circuits**	6	**A** ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. **N** ELEC2401	Semester 2
AMME2301 **Mechanics of Solids**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (MATH1003 or MATH1903 or MATH1907), (ENGG1802 or PHYS1001 or PHYS1901)	Semester 2
MECH2400 **Mechanical Design 1**	6	**A** ENGG1802,AMME2302 **C** AMME2301	Semester 2
MTRX2700 **Mechatronics 2**	6	**P** MTRX1701 and MTRX1702 **N** ELEC2601, ELEC3607	Semester 1
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
Combined degree students take MATH2067 as alternative.			
MATH2065 **Partial Differential Equations (Intro)**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2005, MATH2905, MATH2965, MATH2067	Semester 2 Summer Main
Combined degree students take MATH2067 as alternative.			
Third year			
AMME3500 **System Dynamics and Control**	6	**P** AMME2500; (MATH2061 or MATH2961 or MATH2067)	Semester 1
ELEC3404 **Electronic Circuit Design**	6	**A** A background in basic electronics and circuit theory is assumed. **N** ELEC3401	Semester 1
MECH3660 **Manufacturing Engineering**	6	**A** AMME2200, AMME2301, AMME2302 **P** (AERO1560 or MECH1560 or MTRX1701 or ENGG1800 or ENGG1805) and (ENGG1802 or PHYS1001 or PHYS1901)	Semester 1
MTRX3700 **Mechatronics 3**	6	**P** MTRX2700 **N** MECH4710	Semester 2
MECH3460 **Mechanical Design 2**	6	**A** Properties of engineering materials including fatigue failure theories. Statics and dynamics properties of machines. Practical use of Word and Excel including the use of the `solver' and graphing capabilities built into the spreadsheet. The use of a spreadsheet is mandatory. **P** MECH2400 and AMME2301	Semester 2
AMME2200 **Thermodynamics and Fluids**	6	**A** MATH1001; MATH1002; MATH1003.	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Combined degree students are exempt from this unit.			
ELEC3204 **Power Electronics and Applications**	6	**A** Differential equations, linear algebra, complex variables, analysis of linear circuits. Fourier theory applied to periodic and non-periodic signals. Software such as MATLAB to perform signal analysis and filter design. Familiarity with the use of basic laboratory equipment such as oscilloscope, function generator, power supply, etc. **P** ELEC2104 **N** ELEC3202	Semester 1
Combined degree students are exempt from this unit.			
MECH3661 **Engineering Management**	6	**A** It is expected that students will understand the concepts previously presented in ENGG1803 Professional Engineering. It is assumed that the students have an understanding of professional engineering issues, and are experienced in academic writing (both essays and reports), including appropriate referencing techniques, oral presentations and the project management process (particularly in group situations). Such previous knowledge will assist students in the development their awareness of the issues involved with engineering management.	Semester 2
Combined degree students are exempt from this unit.			
Fourth year			
MECH4601 **Professional Engineering 2**	6	**A** MECH3661, ENGG1803, AMME4100 **P** MECH3660	Semester 1
ENGG4000 **Practical Experience**		**P** 36 Credit Points of Senior Units *Students should have completed three years of their BE program before enrolling in this unit.*	Semester 1 Semester 2
Students must select 12cp from the following block of units.			
Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
AMME4111 **Honours Thesis A**	6	**P** 36 credit points of senior units of study and 2nd/3rd year WAM of 65% or greater **C** AMME4112 **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 1.			
AMME4112 **Honours Thesis B**	6	**P** AMME4111 Honours Thesis A **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 2			
AMME4121 **Engineering Project A**	6	**P** 36 credit points of senior units of study. **C** AMME4122 **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semester 1.			
AMME4122 **Engineering Project B**	6	**P** AMME4121 Engineering Project A **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semster 2			
Acceptable alternative units of study			
Students in the Honours program must enrol in AMME4111 & AMME4112, students in the Pass program must enrol in AMME4121 & AMME4122.			
Most units of study offered by the Faculty of Science shown in the tables can be replaced by an equivalent advanced level unit, subject to prerequisite conditions (as required by the Faculty of Science) being met. Students considering doing advanced options should seek advice from their department before enrolling.			
Students undertaking Study Abroad in a particular year of their degree must enrol in the appropriate International Exchange Program units of study as an alternative to a semester's standard units.			
Resolutions of the Faculty of Engineering relating to this table:			
BE(Mechatronic Engineering)			
In addition to gaining credit for the units of study set out in this table, candidates are required to complete 18 credit points from the table of recommended elective units of study for Mechatronic Engineering. A minimum of 192 credit points is required to be eligible for the award of the degree.			
BE(Mechatronic Engineering)/BSc or BCom or BMedSci			
In addition to gaining credit for the units of study set out in this table, candidates are required to complete 6 credit points from the table of recommended elective units of study for Mechatronic Engineering and at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc and BMedSci, or the Faculty of Economics and Business for the BE/BCom. A minimum of 240 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.			
BE(Mechatronic Engineering)/BA			
In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 18 credit points from the table of recommended elective units of study for Mechatronic Engineering and at least 84 credit points of units of study given by the Faculty of Arts for the BE/BA. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.			
BE(Mechatronic Engineering)/LLB			
In addition to gaining credit for the units of study set out in this table, candidates are required to complete 6 credit points from the table of recommended elective units of study for Mechatronic Engineering and at least 144 credit points of units of study given by the Faculty of Law for the BE/LLB. A minimum of 288 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.			
Recommended elective units of study			
MECH4720 **Sensors and Signals**	6	**A** Strong Matlab skills **P** MTRX3700	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
MECH4730 **Computers in Real-Time Control and Inst**	6	**P** MTRX3700 **N** ELEC4602 Real Time Computing	Semester 1
MTRX4700 **Experimental Robotics**	6	**P** AMME3500; MTRX3700	Semester 1
AMME4500 **Guidance and Control**	6	**P** AMME3500.	Semester 2
AMME4700 **Inertial Navigation & the Kalman Filter** *This unit of study is not available in 2011*	6	**P** AERO4701 or MECH4720 or MECH4730 or MTRX4700 or AERO4560. *Note: Department permission required for enrolment*	Semester 2
AMME4710 **Computer Vision and Image Processing**	6	**A** MECH4720 or MECH4730	Semester 2
AMME4790 **Introduction to Biomechatronics**	6	**P** MTRX3700 or MECH3921	Semester 2

Notes

1. Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.

2. Units of study not included in this table may also be selected subject to the approval of the Head of School Aerospace, Mechanical and Mechatronic Engineering.

Mechatronic (Space) Engineering stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Mechatronic (Space) Engineering			
Candidates for the degree of Bachelor of Engineering in Mechatronic Engineering (Space Engineering) are required to gain credit for the core units of study set out below. Any additional credit necessary shall be gained by completing additional credit points of elective units of study as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points			
Core units of study			
First year			
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MTRX1701 **Mechatronics Engineering Introductory**	6	**N** AERO1560, MECH1560, ENGG1800 *Note: Department permission required for enrolment*	Semester 1
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
MTRX1702 **Mechatronics 1**	6	**N** ELEC1101, ELEC2602, COSC1902, COSC1002	Semester 2
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
ENGG1801 **Engineering Computing** INFO 1103 is an acceptable alternate.	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
AMME1550 **Dynamics 1** PHYS1001 is an acceptable alternative for BE/BSc physics majors.	6		Semester 2
Second year			
ELEC2104 **Electronic Devices and Circuits**	6	**A** ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. **N** ELEC2401	Semester 2
AMME2301 **Mechanics of Solids**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (MATH1003 or MATH1903 or MATH1907), (ENGG1802 or PHYS1001 or PHYS1901)	Semester 2
MATH2067 **DEs and Vector Calculus for Engineers**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2005, MATH2905, MATH2061, MATH2961, MATH2065, MATH2965	Semester 1
AMME2500 **Engineering Dynamics**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (AMME1550 or PHYS1001 or PHYS1901)	Semester 1
AERO2705 **Space Engineering 1**	6	**A** ENGG1801 **P** AERO1560 (or MECH1560 or MTRX1701), MATH1001, MATH1002, MATH1003)	Semester 2
MTRX2700 **Mechatronics 2**	6	**P** MTRX1701 and MTRX1702 **N** ELEC2601, ELEC3607	Semester 1
MECH2400 **Mechanical Design 1**	6	**A** ENGG1802,AMME2302 **C** AMME2301	Semester 2
AMME2302 **Materials 1**	6	**N** CIVL2110	Semester 1
Third year			
AMME3500 **System Dynamics and Control**	6	**P** AMME2500; (MATH2061 or MATH2961 or MATH2067)	Semester 1
MTRX3700 **Mechatronics 3**	6	**P** MTRX2700 **N** MECH4710	Semester 2
MECH3660 **Manufacturing Engineering**	6	**A** AMME2200, AMME2301, AMME2302 **P** (AERO1560 or MECH1560 or MTRX1701 or ENGG1800 or ENGG1805) and (ENGG1802 or PHYS1001 or PHYS1901)	Semester 1
AERO3760 **Space Engineering 2**	6	**P** AERO2705	Semester 2
MECH3661 **Engineering Management** Combined degree students are exempt from this unit.	6	**A** It is expected that students will understand the concepts previously presented in ENGG1803 Professional Engineering. It is assumed that the students have an understanding of professional engineering issues, and are experienced in academic writing (both essays and reports), including appropriate referencing techniques, oral presentations and the project management process (particularly in group situations). Such previous knowledge will assist students in the development their awareness of the issues involved with engineering management.	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC3204 **Power Electronics and Applications**	6	**A** Differential equations, linear algebra, complex variables, analysis of linear circuits. Fourier theory applied to periodic and non-periodic signals. Software such as MATLAB to perform signal analysis and filter design. Familiarity with the use of basic laboratory equipment such as oscilloscope, function generator, power supply, etc. **P** ELEC2104 **N** ELEC3202	Semester 1
Combined degree students are exempt from this unit.			
ELEC3404 **Electronic Circuit Design**	6	**A** A background in basic electronics and circuit theory is assumed. **N** ELEC3401	Semester 1
Combined degree students are exempt from this unit.			
AMME2200 **Thermodynamics and Fluids**	6	**A** MATH1001; MATH1002; MATH1003.	Semester 2
Combined degree students are exempt from this unit.			
Fourth year			
AERO4701 **Space Engineering 3**	6	**P** AERO3760	Semester 1
ENGG4000 **Practical Experience**		**P** 36 Credit Points of Senior Units *Students should have completed three years of their BE program before enrolling in this unit.*	Semester 1 Semester 2
MECH4601 **Professional Engineering 2**	6	**A** MECH3661, ENGG1803, AMME4100 **P** MECH3660	Semester 1
Students must select 12cp from the following block of units.			
Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
AMME4111 **Honours Thesis A**	6	**P** 36 credit points of senior units of study and 2nd/3rd year WAM of 65% or greater **C** AMME4112 **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 1			
AMME4112 **Honours Thesis B**	6	**P** AMME4111 Honours Thesis A **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semster 2			
AMME4121 **Engineering Project A**	6	**P** 36 credit points of senior units of study. **C** AMME4122 **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semster 1			
AMME4122 **Engineering Project B**	6	**P** AMME4121 Engineering Project A **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semster 2			

Acceptable alternative units of study

Students in the Honours program must enrol in AMME4111 & AMME4112, students in the Pass program must enrol in AMME4121 & AMME4122.

Most units of study offered by the Science Faculty shown in the tables can be replaced by an equivalent advanced level unit, subject to prerequisite conditions (as required by the Faculty of Science) being met. Students considering doing advanced options should seek advice from their department before enrolling.

Students undertaking Study Abroad in a particular year of their degree must enrol in the appropriate International Exchange Program units of study as an alternative to a semester's standard units.

Resolutions of the Faculty of Engineering relating to this table:

BE(Mechatronic Engineering)(Space)

In addition to gaining credit for the units of study set out in the above table, candidates are required to complete 12 credit points from the table of recommended elective units of study for Mechatronic (Space) Engineering. A minimum of 192 credit points is required to be eligible for the award of BE(Mechatronic)(Space).

BE(Mechatronic Engineering)(Space)/BSc or BCom or BMedSci

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc and BMedSci, or the Faculty of Economics and Business for the BE/BCom. A minimum of 240 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.

BE(Mechatronic Engineering)(Space)/BA

In addition to gaining credit for the units of study set out in this table, candidates are required to complete at least 84 credit points of units of study given by the Faculty of Arts for the BE/BA and 12 credit points from the table of recommended elective units of study for Mechatronic Engineering. A minimum of 240 credit points is required to be eligible for the combined degree. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the faculty in which they are undertaking the combined degree.

BE(Mechatronic Engineering)(Space)/LLB

In addition to gaining credit for the core units of study set out in this table, candidates are required to complete at least 144 credit points of units of study given by the Faculty of Law for the BE/LLB. A minimum of 288 credit points is required to be eligible for the combined degrees. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and IT and the Faculty of Law.

Recommended elective units of study

MECH4720 **Sensors and Signals**	6	**A** Strong Matlab skills **P** MTRX3700	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
MECH4730 **Computers in Real-Time Control and Inst**	6	**P** MTRX3700 **N** ELEC4602 Real Time Computing	Semester 1
MTRX4700 **Experimental Robotics**	6	**P** AMME3500; MTRX3700	Semester 1
AMME4500 **Guidance and Control**	6	**P** AMME3500.	Semester 2
AMME4710 **Computer Vision and Image Processing**	6	**A** MECH4720 or MECH4730	Semester 2
AMME4790 **Introduction to Biomechatronics**	6	**P** MTRX3700 or MECH3921	Semester 2
AMME4700 **Inertial Navigation & the Kalman Filter** *This unit of study is not available in 2011*	6	**P** AERO4701 or MECH4720 or MECH4730 or MTRX4700 or AERO4560. *Note: Department permission required for enrolment*	Semester 2
These units are also available to other Space stream students.			

Notes

1. Choice of electives as shown in the above table will depend on subject availability, timetabling and prerequisite conditions.

2. Units of study not included in this table may also be selected subject to the approval of the Head of School Aerospace, Mechanical and Mechatronic Engineering.

Mechanical (Biomedical) Engineering stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Mechanical (Biomedical) Engineering			
Candidates for the degree of Bachelor of Engineering in Mechanical Engineering (Biomedical) are required to gain credit for the core units of study set out below. Any additional credit necessary shall be gained by completing additional credit points of recommended or elective units of study, as recommended by the Faculty, as may be necessary to gain credit for a total of not less than 192 credit points.			
Core units of study			
First year			
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
CHEM1101 **Chemistry 1A** Normally taken in Semester 2.	6	**A** HSC Chemistry and Mathematics **C** Recommended concurrent units of study: 6 credit points of Junior Mathematics **N** CHEM1001, CHEM1109, CHEM1901, CHEM1903	Semester 1 Semester 2 Summer Main
BIOL1003 **Human Biology** BE/BMedSc students do MBLG1001 instead of BIOL1003.	6	**A** HSC 2-unit Biology. Semester 1 students who have not completed HSC biology (or equivalent) are strongly advised to take the Biology Bridging Course (in February). **N** BIOL1903 *It is recommended that BIOL (1001 or 1911) be taken concurrently with this unit of study.*	Semester 1 Summer Main
AMME1550 **Dynamics 1** PHYS1001 is an acceptable alternate for BE/BSc students.	6		Semester 2
ENGG1803 **Professional Engineering 1** Students enrolled in combined degrees or Advanced Engineering are exempt from this unit AND this unit is normally taken in Semester 1.	6		Semester 1 Semester 2
Second year			
MATH2067 **DEs and Vector Calculus for Engineers**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2005, MATH2905, MATH2061, MATH2961, MATH2065, MATH2965	Semester 1
ELEC2004 **Electrical Engineering: Foundations**	6	**N** ELEC1103, ELEC1601	Semester 1
AMME2301 **Mechanics of Solids**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (MATH1003 or MATH1903 or MATH1907), (ENGG1802 or PHYS1001 or PHYS1901)	Semester 2
AMME2500 **Engineering Dynamics**	6	**P** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (AMME1550 or PHYS1001 or PHYS1901)	Semester 1
AMME2200 **Thermodynamics and Fluids**	6	**A** MATH1001; MATH1002; MATH1003.	Semester 2
AMME2302 **Materials 1**	6	**N** CIVL2110	Semester 1
MECH2400 **Mechanical Design 1**	6	**A** ENGG1802,AMME2302 **C** AMME2301	Semester 2
MECH2901 **Anatomy and Physiology for Engineers**	6	**A** A basic understanding of biology. Recommended: BIOL1003 (or equivalent)	Semester 2
Third year			
MECH3261 **Fluid Mechanics**	6	**P** AMME2200	Semester 1
MECH3361 **Mechanics of Solids 2**	6	**P** AMME2301 and AMME 2302	Semester 2
MECH3362 **Materials 2**	6	**A** This subject requires you to have two important skills to bring in: (1) A good understanding of basic knowledge and principles of material science and engineering from AMME2302 Materials I and mechanics of solids for simple structural elements (in tension, bending, torsion) from AMME2301 ; (2) Reasonable mathematical skills in calculation of stresses and strains in simple structural elements. **P** AMME2301 and AMME2302	Semester 1
MECH3921 **Biomedical Design and Technology**	6	**A** BIOL1003; MECH2901; AMME2302; MECH2400	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
AMME3500 **System Dynamics and Control**	6	**P** AMME2500; (MATH2061 or MATH2961 or MATH2067)	Semester 1
Students in combined degrees are exempt from this unit.			
MECH3660 **Manufacturing Engineering**	6	**A** AMME2200, AMME2301, AMME2302 **P** (AERO1560 or MECH1560 or MTRX1701 or ENGG1800 or ENGG1805) and (ENGG1802 or PHYS1001 or PHYS1901)	Semester 1
Students enrolled in combined degrees are exempt from this unit.			
MECH3661 **Engineering Management**	6	**A** It is expected that students will understand the concepts previously presented in ENGG1803 Professional Engineering. It is assumed that the students have an understanding of professional engineering issues, and are experienced in academic writing (both essays and reports), including appropriate referencing techniques, oral presentations and the project management process (particularly in group situations). Such previous knowledge will assist students in the development their awareness of the issues involved with engineering management.	Semester 2
Students enrolled in combined degrees are exempt from this unit.			
MECH3460 **Mechanical Design 2**	6	**A** Properties of engineering materials including fatigue failure theories. Statics and dynamics properties of machines. Practical use of Word and Excel including the use of the `solver' and graphing capabilities built into the spreadsheet. The use of a spreadsheet is mandatory. **P** MECH2400 and AMME2301	Semester 2
Students enrolled in combined degrees are exempt from this unit.			
Fourth year			
MECH4601 **Professional Engineering 2**	6	**A** MECH3661, ENGG1803, AMME4100 **P** MECH3660	Semester 1
MECH4961 **Biomechanics and Biomaterials**	6	**A** MECH3300 or MECH3362 **P** AMME2302; MECH2900 or MECH2901 **N** MECH4960	Semester 2
ENGG4000 **Practical Experience**		**P** 36 Credit Points of Senior Units *Students should have completed three years of their BE program before enrolling in this unit.*	Semester 1 Semester 2
ELEC3802 **Fundamentals of Biomedical Engineering**	6	**A** A knowledge of basic electrical engineering is required: Ohm's law, Thevenin and Nortons' theorems, basic circuit theory involving linear resistors, capacitors and inductors, a basic knowledge of bipolar and field effect transistor theory, simplified theoretical mechanism of operation of transformers. **N** ELEC3801	Semester 1
Students must select 12cp from the following block of units.			
Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
AMME4111 **Honours Thesis A**	6	**P** 36 credit points of senior units of study and 2nd/3rd year WAM of 65% or greater **C** AMME4112 **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 1.			
AMME4112 **Honours Thesis B**	6	**P** AMME4111 Honours Thesis A **N** AMME4121, AMME4122, AMME4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Normally taken in Semester 2.			
AMME4121 **Engineering Project A**	6	**P** 36 credit points of senior units of study. **C** AMME4122 **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semester 1.			
AMME4122 **Engineering Project B**	6	**P** AMME4121 Engineering Project A **N** AMME4111, AMME4112, AMME4010	Semester 1 Semester 2
Normally taken in Semester 2.			

Acceptable alternative units of study

Students in the Honours program must enrol in AMME4111 & AMME4112, students in the Pass Program must enrol in AMME4121 & AMME4122.

Advanced engineering 2, 3, or 4 is an acceptable alternative to MECH4601.

The elective AMME4790 Intro Biomechatronics is an acceptable alternative to ELEC3802. Students can not do both.

Most units of study offered by the Science Faculty shown in the tables can be replaced by an equivalent advanced level unit, subject to prerequisite conditions (as required by the Faculty of Science) being met. Students considering doing advanced options should seek advice from their department before enrolling.

Students undertaking Study Abroad in a particular year of their degree must enrol in the appropriate International Exchange Program units of study as an alternative to a semester's standard units.

Resolutions of the Faculty of Engineering relating to this table:

BE (Mechanical (Biomedical) Engineering)

In addition to gaining credit for the units of study set out in this table, candidates are required to complete sufficient Biomedical Engineering electives from the table below so as to bring their total of eligible credit points to at least 192. A minimum of 192 credit points is required to be eligible for the award of the degree of BE(Mechanical)(Biomedical).

BE(Mechanical (Biomedical) Engineering) BSc or BCom or BMedSci or BA or LLB

In addition to gaining credit for the units of study set out in this table, candidates are required to complete sufficient Biomolecular Engineering electives from the table below so as to bring their total of eligible engineering credit points to at least 144. Further to this they are required to complete at least 96 credit points of units of study given by the Faculty of Science for the BE/BSc and BMedSci, or the Faculty of Economics and Business for the BE/BCom. In the case of the BE/BA, they are required to complete at least 84 credit points of units of study given by the Faculty of Arts, and the remaining 12 credit points will be Biomedical Engineering electives from the table below.

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
In the case of the BE/LLB, they are required to complete 96 credit points of compulsory Law units of study and a further 48 credit points of elective Law units of study. A minimum of 240 credit points is required to be eligible for the combined degrees BE/BSc, BMedSci, BE/BCom and BE/BA. A minimum of 288 credit points is required to be eligible for the combined degree BE/LLB. candidates should refer to the joint resolutions of the faculty in which they are undertaking the second degree.			
Recommended elective units of study			
AMME4981 **Applied Biomedical Engineering**	6	**A** MECH3921, MECH3362 **P** 6cp of junior biology; 6cp of junior chemistry; AMME2302	Semester 1
AMME4990 **Biomedical Product Development**	6	**A** Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level. **P** 6 credit points of junior biology 6 credit points of junior chemistry MECH2901 or 6 credit points of intermediate physiology or equivalent MECH3921	Semester 1
AMME4210 **Computational Fluid Dynamics**	6	**A** Partial differental equations, finite difference methods, linear algebra, matrix methods, pressure, force, acceleration, continuity, streamline and streamfunction, viscosity, control parameters, non-dimensionalisation. **P** MECH3261 or AERO3260 *Note: Department permission required for enrolment*	Semester 1
AMME4790 **Introduction to Biomechatronics**	6	**P** MTRX3700 or MECH3921	Semester 2
MECH4902 **Orthopaedic and Surgical Engineering**	6	**A** Basic concepts in engineering mechanics-statics, dynamics, and solid mechanics; Basic concepts in materials science, specifically with regard to types of materials and the relation between properties and microstructure; and A basic understanding of human biology and anatomy. **P** AMME2301, AMME2302, ENGG1802, BIOL1003, MECH2901, MECH3921.	Semester 2
AMME4971 **Tissue Engineering**	6	**A** MECH3921 **P** 6cp of junior biology; 6cp of junior chemistry; MECH2901	Semester 2
AMME4992 **Regulatory Affairs in Medical Industry**	6	**A** Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level. **P** 6 credit points of junior biology 6 credit points of junior chemistry MECH2901 or 6 credit points of intermediate physiology or equivalent MECH3921	Semester 2

5.2 School of Chemical and Biomolecular Engineering

The School of Chemical and Biomolecular Engineering offers the following Bachelor of Engineering degree specialisations:

- Chemical and Biomolecular
- Combined degrees with Science, Commerce, Arts, Medical Science and Law.

Chemical and Biomolecular Engineering stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Chemical and Biomolecular Engineering			
Chemical and Biomolecular Engineering is a broad area that seeks to use a detailed knowledge of chemistry, mathematics and biology to convert raw materials into valuable products as economically and safely as possible. Our undergraduate program trains students so that on graduation they can analyse, design and operate a wide variety of processes and to solve industrially relevant problems. Candidates for the degree of Bachelor of Engineering in Chemical and Biomolecular Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary shall be gained by completing additional credit points of elective units of study, as recommended by the school, as may be necessary to gain credit for a total of not less than 192 credit points.			
Core units of study			
First year			
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
CHEM1101 **Chemistry 1A**	6	**A** HSC Chemistry and Mathematics **C** Recommended concurrent units of study: 6 credit points of Junior Mathematics **N** CHEM1001, CHEM1109, CHEM1901, CHEM1903	Semester 1 Semester 2 Summer Main
CHEM1102 **Chemistry 1B**	6	**P** CHEM (1101 or 1901) or a Distinction in CHEM1001 or equivalent **C** Recommended concurrent units of study: 6 credit points of Junior Mathematics **N** CHEM1002, CHEM1108, CHEM1902, CHEM1904	Semester 1 Semester 2 Summer Main
CHNG1103 **Material & Energy Transformations Intro**	6	**A** Mathematics Extension 1; 2 unit Physics; 2 unit Chemistry.	Semester 2
ENGG1800 **Engineering Disciplines (Intro) Stream A**	6		Semester 1
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
ENGG1803 **Professional Engineering 1**	6		Semester 1 Semester 2
Second year			
CHEM2403 **Chemistry of Biological Molecules**	6	**P** 12 credit points of Junior Chemistry, 6 credit points of Junior Mathematics. **N** CHEM2001, CHEM2901, CHEM2311, CHEM2903, CHEM2913 *To enrol in Senior Chemistry, students are required to have completed CHEM (2401 or 2911 or 2915) and CHEM (2402 or 2912 or 2916). Students are advised that combinations of Intermediate Chemistry units that do not meet this requirement will generally not allow progression to Senior Chemistry.*	Semester 2
CHEM2404 **Forensic and Environmental Chemistry**	6	**P** 12 credit points of Junior Chemistry; 6 credit points of Junior Mathematics **N** CHEM3107, CHEM3197 *To enrol in Senior Chemistry students are required to have completed CHEM (2401 or 2911 or 2915) and CHEM (2402 or 2912 or 2916). Students are advised that combinations of Intermediate Chemistry units that do not meet this requirement will generally not allow progression to Senior Chemistry.*	Semester 1
CHNG2801 **Conservation and Transport Processes**	6	**A** Calculus Computations (Matlab, Excel) Mass and Energy Balances **P** All core 1st year engineering units of study.	Semester 1
CHNG2802 **Applied Maths for Chemical Engineers**	6	**P** All core 1st year engineering units of study. **C** CHNG2803 (Analysis Practice 1) CHNG2801 (Conservation and Transport Processes) CHEM2404 (Forensic and Environmental Chemistry)	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
CHNG2803 **Energy and Fluid Systems Practice**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on qualitative and quantitative information. **P** All core engineering 1st year units of study. **C** CHNG2801 (Conservation and Transport Processes) CHNG2802 (Applied Mathematics for Chemical Engineers) CHEM2404 (Forensic and Environmental Chemistry)	Semester 1
CHNG2804 **Chemical & Biological Systems Behaviour**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. **P** All core 1st year engineering units of study. **C** CHNG2805 (Industrial Systems and Sustainability) CHNG2806 (Analysis Practice 2 - Treatment, Purification and Recovery Systems) CHEM2403 (Chemistry of Biological Molecules)	Semester 2
CHNG2805 **Industrial Systems and Sustainability**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **P** All core 1st year engineering units of study. **C** CHNG2804 (Chemical and Biological Systems Behaviour) CHNG2806 (Analysis Practice 2 - Treatment, Purification & Recovery Systems) CHEM2403 (Chemistry of Biological Molecules)	Semester 2
CHNG2806 **Materials Purification and Recovery**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative and quantitative information **P** All core 1st year engineering units of study. **C** CHNG2804 (Chemical and Biological Systems Behaviour) CHNG2805 (Industrial Systems and Sustainability) CHEM2403 (Chemistry of Biological Molecules)	Semester 2
Third year			
CHNG3801 **Process Design**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in second year have been successfully completed. **P** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **C** CHNG3803, CHNG3802	Semester 1
CHNG3802 **Operating/Improving Industrial Systems**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in second year have been successfully completed. **P** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **C** CHNG3801 (Process Design) CHNG3803 (Design Practice 1 - Chemical & Biological Processes)	Semester 1
CHNG3803 **Chemical/Biological Process Design**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on qualitative and quantitative information. **P** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **C** CHNG3801 (Process Design) CHNG3802 (Operation, Analysis and Improvement of Industrial Systems)	Semester 1
CHNG3805 **Product Formulation and Design**	6	**A** Mass and Energy Balances Conservation and Transport Phenomena Applied Mathematics (for Chemical Engineering) Process Design Concepts Process Control and Optimisation Concepts **P** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **C** CHNG3806 (Management of Industrial Systems) CHNG3807 (Design Practice 2 - Products and Value Chains)	Semester 2
CHNG3806 **Management of Industrial Systems**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **P** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **C** CHNG3805 (Product Formulation and Design) CHNG3807 (Design Practice 2 - Products and Value Chains)	Semester 2
CHNG3807 **Products and Value Chains**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on qualitative and quantitative information. **P** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **C** CHNG3805 (Product Formulation and Design) CHNG3806 (Management of Industrial Systems)	Semester 2
Fourth year			
CHNG4001 **Practical Experience**		**A** Advisory prerequisite: 28 credit points of 3rd year units	Semester 1 Semester 2
CHNG4802 **Chemical Engineering Design A**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering unit of study in third year have been successfully completed. **P** CHNG3801,CHNG3802, CHNG3803, CHNG3805, CHNG3806, CHNG3807	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
CHNG4806 **Chemical Engineering Design B**	6	**A** Enrolment in this unit of study assumes that all core chemical engineering units of study in third-year have been successfully completed, as well as the related first semester unit of study Chemical Engineering Design A. **P** CHNG4802 or CHNG4203 *Note: Department permission required for enrolment in the following sessions: Semester 1*	Semester 1 Semester 2
Students must select 12cp from the following block of units. Students enrol in either Honours Thesis A & B or Engineering Project A & B. For enrolment in Honours an ISWAM of 65% or greater is required.			
CHNG4811 **Honours Thesis A**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. **P** CHNG3801, CHNG3802, CHNG3803, CHNG3805, CHNG3806, CHNG3807. This unit is available to only those students who have gained an entry to the Honours degree. **C** CHNG4812 **N** CHNG4801, CHNG4813 *Note: Department permission required for enrolment* *Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.*	Semester 1 Semester 2
CHNG4812 **Honours Thesis B**	6	**A** Enrolment in this unit of study assumes that Honours Thesis A and all (six) core chemical engineering units of study in third year have been successfully completed. **C** CHNG4811 **N** CHNG4805, CHNG4814 *Note: Department permission required for enrolment* *Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.*	Semester 1 Semester 2
CHNG4813 **Engineering Project A**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. **P** CHNG3801, CHNG3802, CHNG3803, CHNG3805, CHNG3806, CHNG3807 **C** CHNG4814 **N** CHNG4805, CHNG4811 *Note: Department permission required for enrolment in the following sessions: Semester 2* *Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.*	Semester 1 Semester 2
CHNG4814 **Engineering Project B**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. **C** CHNG4813 **N** CHNG4805, CHNG4812 *Note: Department permission required for enrolment in the following sessions: Semester 1* *Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.*	Semester 1 Semester 2

Notes

1. Students in the Honours program must enrol in CHNG4811 & CHNG4812, students in the Pass program must enrol in CHNG4813 & CHNG4814.

2. For core units of study offered by other than the Faculty of Engineering, any assumed knowledge and/or prerequisite requirements will be as prescribed by that Faculty.

3. Students doing any of the combined degree options BE/BA, BE/BCom, BE/BSc, BE/BMedSc and BE/LLB will be exempt from a First Year core unit of study and from Second Year Chemistry.

4. Students undertaking study overseas as part of an exchange program will enrol in CHNG3041,CHNG3042 in place of 3rd year core or CHNG4041,CHNG4042 in place of 4th year core.

Resolutions of the Faculty of Engineering relating to Chemical and Biomolecular Engineering

Bachelor of Engineering in Chemical and Biomolecular Engineering

Candidates for this degree are required to complete all the core units of study (total 156 credit points). They are also required to gain at least 24 credit points from the Third and Fourth Year electives listed in the table of recommended elective units of study for BE (Chem & Biomolec) as shown below.

Combined degree (Bachelor of Engineering in Chemical & BioMolecular Engineering with either a Bachelor of Arts or Bachelor of Science)

Candidates in these combined degree options are required to complete all the core units of study except where specific exemptions are noted. They are also required to gain at least 12 credit points from the Fourth Year electives listed in the table of recommended elective units of study for BE (Chem & Biomolec) as shown below. This total of 144 credit points is only sufficient to be awarded a Bachelor of Engineering in Chemical & Biomolecular Engineering as part of these combined degree programs.

Combined degree (Bachelor of Engineering (Chemical & Biomolecular) with a Bachelor of Commerce)

Candidates in this combined degree option are required to complete all the core units of study except where specific exemptions are noted. They are also required to gain at least 6 credit points from the Fourth Year electives listed in the table of recommended elective units of study for BE (Chem & Biomolecular) as shown below. This total of 144 credit points is only sufficient to be awarded a Bachelor of Engineering in Chemical & Biomolecular Engineering as part of this combined degree program.

Acceptable alternative units of study

Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent Advanced level unit of study subject to prerequisite conditions (as required by the Faculty of Science) being met. Students considering doing Advanced options should seek advice from their Department before enrolling.

Recommended elective units of study

Third year

CHNG3804 **Biochemical Engineering**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering units of study in second year have been successfully completed. **P** CHNG2801; CHNG2802, CHNG2803; CHNG2804; CHNG2805; CHNG2806;	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
CHNG3808 **Polymer Engineering**	6	**P** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **C** CHNG3801	Semester 1
Fourth year			
CHNG4203 **Major Industrial Project**	24	**P** Passed at least 144 credit points and have a WAM greater than credit average Students wishing to do this unit of study are required to discuss the matter with the Head of School prior to enrolment. *Note: Department permission required for enrolment* *Department permission required*	Semester 1
CHNG5001 **Process Systems Engineering**	6	**A** Mathematics, physics and modeling. Assumed knowledge at the bachelor of Science level. *This unit of study is for Masters students and can be selected as an elective by 4th year students.*	Semester 2
CHNG5003 **Green Engineering**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year or their equivalent have been successfully completed.	Semester 2
CHNG5004 **Particles and Surfaces**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year or their equivalent have been successfully completed.	Semester 1
CHNG5005 **Wastewater Eng - Systems and Practice**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve 'real' chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources.	Semester 2
CHNG5601 **Membrane Science**	6		Semester 1
CHNG5602 **Cellular Biophysics**	6		Semester 1
CHNG5603 **Analysis, Modelling, Control: BioPhy Sys**	6	**A** It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling	Semester 1
CHNG5604 **Membrane Science Laboratory**	6		Semester 2
CHNG5605 **Bio-Products: Laboratory to Marketplace**	6		Semester 2

5.3 School of Civil Engineering

The School of Civil Engineering offers the following Bachelor of Engineering degree specialisations:

- Civil Engineering
- Civil Structural
- Civil Environmental
- Civil Geotechnical
- Civil Construction Engineering and Management
- Project Engineering and Management, and
- Combined degrees with Science, Commerce, Arts, Medical Science, Design in Architecture and Law.

Civil Engineering stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Civil Engineering			
Candidates for the degree of Bachelor of Engineering in Civil Engineering are required to gain credit for the core units of study set out below. Any additional credit necessary to satisfy the degree requirement of not less than 192 credit points shall be gained by completing additional elective units of study, as recommended by the School (as set out below).			
Core units of study (all streams except Project Management)			
First year			
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
ENGG1800 **Engineering Disciplines (Intro) Stream A**	6		Semester 1
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics **C** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) **N** PHYS1002, PHYS1901, EDUH1017	Semester 1
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
ENGG1803 **Professional Engineering 1**	6		Semester 1 Semester 2
GEOL1501 **Engineering Geology 1**	6	**A** No previous knowledge of Geology assumed **N** GEOL1002, GEOL1902, GEOS1003, GEOS1903	Semester 2
Second year			
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
CIVL2110 **Materials**	6	**N** AMME2302	Semester 1
CIVL2810 **Engineering Construction and Surveying**	6	**A** MATH1001, MATH1002, MATH1003, MATH1005	Semester 1
CIVL2201 **Structural Mechanics**	6	**P** ENGG1802 Engineering Mechanics **N** AMME2301	Semester 1
CIVL2230 **Intro to Structural Concepts and Design**	6	**A** ENGG1802 Engineering Mechanics, CIVL2110 Materials CIVL2201 Structural Mechanics	Semester 2
CIVL2410 **Soil Mechanics**	6	**A** CIVL2201 Structural Mechanics	Semester 2
CIVL2611 **Introductory Fluid Mechanics**	6	**A** MATH1001 Differential Calculus, ENGG1802 Engineering Mechanics, CIVL2201 Structural Mechanics	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Third year			
CIVL3205 Concrete Structures 1	6	**A** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design	Semester 1
CIVL3612 Fluid Mechanics	6	**A** ENGG1802 Engineering Mechanics, MATH2061 - Linear Mathematics and Vector Calculus, CIVL2201 - Structural Mechanics, CIVL2611 - Fluid Mechanics: Inviscid Flow	Semester 1
CIVL3010 Engineering and Society	6	**A** ENGG1803 Professional Engineering	Semester 1
CIVL3812 Project Appraisal	6	**A** MATH1005	Semester 1
CIVL3206 Steel Structures 1	6	**A** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design	Semester 2
Fourth year			
CIVL4811 Engineering Design and Construction	6	**A** CIVL2810 Engineering Construction and Survey	Semester 1
CIVL4903 Civil Engineering Design	6	**A** CIVL3205 Concrete Structures 1 and CIVL3206 Steel Structures 1.	Semester 2
ENGG4000 Practical Experience		**P** 36 Credit Points of Senior Units *Students should have completed three years of their BE program before enrolling in this unit.*	Semester 1 Semester 2
Students must select 12cp from the following block of units.			
Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
CIVL4022 Honours Thesis A	6	**P** 30 credit points of Senior Units of Study, ISWAM 65 or over *Note: Department permission required for enrolment*	Semester 1 Semester 2
CIVL4023 Honours Thesis B	6	**P** 30 credit points of Senior units of study and successful completion of CIVL4022 - Honours Thesis A *Note: Department permission required for enrolment*	Semester 1 Semester 2
CIVL4024 Engineering Project A	6	**P** 30 Credit Points of Senior Units of Study *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
CIVL4025 Engineering Project B	6	**P** 30 Credit Points of Senior Units of Study and successful completion of CIVL4024 Engineering Project A **N** CIVL4022, CIVL4023 *Note: Department permission required for enrolment in the following sessions: Semester 1*	Semester 1 Semester 2

Notes

1. Students in the Honours program must enrol in CIVL4022 & CIVL4023, students in the Pass Program must enrol in CIVL4024 & CIVL4025.

2. With special permission from the Director of Learning and Teaching, Civil Engineering, it is possible to take Honours Thesis A and Engineering Project A in semester 2 and Honours Thesis B and Engineering Project B in semester 1.

3. For core units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by the Faculty.

Resolutions of the Faculty of Engineering relating to Civil Engineering (except Project Engineering Management)

Candidates for the degree of Bachelor of Engineering in Civil Engineering are expected to complete all the core units for the study in the above specialisation requirements (144 credit points). They are also required to gain at least 18 credit points from the 3rd year Civil recommended elective units of study listed below, and 18 credit points from fourth year Civil recommended elective units of study listed below. The remaining 12 credit points can be obtained from any of the listed elective units or from units of study in other Faculties subject to approval from the Director of the Learning and Teaching Civil Engineering.

Candidates for one of the combined degree programs (that is, Bachelor of Engineering in Civil Engineering with either a Bachelor of Arts, Bachelor of Science, Bachelor of Medical Science, Bachelor of Laws or Bachelor of Commerce) are required to complete all of the core units of study listed above (144 credit points), This total of 144 credit points (plus 12 credit points of electives from the list of electives below for combined degrees with Bachelor of Arts) is only sufficient to be awarded a Bachelor of Engineering in Civil Engineering as part of an approved combined degree program. The remaining credit points for the combined degree will be taken in the appropriate Faculty (Arts, Science, Law or Economics) and candidates should refer to the Joint Resolutions of the Faculty of Engineering and the relevant faculty requirements.

Candidates taking a combined degree with Science or Medical Science may count the Science subjects in the Civil Engineering core to their 96 credits points of Science subjects. Electives from the list below should be taken to complete 144 credit points of Engineering subjects.

Candidates taking a combined degree with Design in Architecture please see the separate Table of core units of study.

To meet specialisation requirements for either Construction Engineering and Management, Structural Engineering, Environmental Engineering or Geotechnical Engineering, students must enrol in at least 3 electives from the relevant stream listed below and undertake a thesis in a related topic. Students may enrol in a maximum of 4 electives from the Construction Engineering and Management stream.

Construction Engineering and Management Stream: CIVL3805, CIVL3813, CIVL4810, CIVL4814, CIVL4815.

Structural Engineering Stream: CIVL3235, CIVL5266, CIVL5269, CIVL5458

Environmental Stream: CIVL3614, CIVL5351, CIVL5668, CIVL5670

Geotechnical Engineering Stream: CIVL3411, CIVL5351, CIVL5452, CIVL5458

Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent advanced level units of study subject to prerequisite conditions (as required by the Faculty of Science) being met.

Students considering doing advanced options should seek advice from the relevant department before enrolling.

Acceptable alternative units of study

The Faculty has prescribed the following acceptable alternatives to core units of study listed in the above specialisation requirements:

GEOL1501 Engineering Geology 1 (6cps), acceptable alternative: GEOL1001 and GEOL1002

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Recommended elective units of study			
Second year			
CIVL2511 **Instrumentation and Measurement**	6	**A** CIVL2201 Structural Mechanics, ENGG1802 Engineering Mechanics	Semester 2
MATH2065 **Partial Differential Equations (Intro)**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2005, MATH2905, MATH2965, MATH2067	Semester 2 Summer Main
Third year			
CIVL3235 **Structural Analysis**	6	**A** CIVL2110, CIVL2230 and MATH2061	Semester 2
CIVL3411 **Geotechnical Engineering**	6	**A** CIVL2410 Soil Mechanics	Semester 2
CIVL3613 **Ocean and Coastal Engineering**	6	**A** CIVL2611 - Fluid Mechanics: Inviscid Flow *Note: Department permission required for enrolment*	Semester 2
CIVL3805 **Project Scope, Time and Cost Management**	6	**A** CIVL2810 - Engineering Construction and Surveying **P** 36 Intermediate credit points	Semester 2
Fourth year			
CIVL3813 **Contracts Formulation and Management**	6	**A** CIVL3805 Project Scope, Cost & Time Management **P** 36 Intermediate (2nd year) credit points	Semester 2
CIVL4615 **Water Resources and Hydrology** *This unit of study is not available in 2011*	6	**A** ENGG1802 - Engineering Mechanics, MATH2061 - Linear Mathematics and Vector Calculus, CIVL2611 - Fluid Mechanics: Inviscid Flow, CIVL3612 - Environmental and Fluid Engineering: Viscous Flow	Semester 1
CIVL4810 **Mgmnt of People, Quality and Risk in PE**	6	**A** CIVL3805 Project Scope, Time and Cost Management	Semester 2
CIVL4814 **Project Procurement and Tendering**	6	**A** CIVL3805 Project Scope, Time and Cost Management	Semester 2
CIVL4815 **Project Formulation**	6	**P** CIVL3805 Project Scope, Time and Cost Management, CIVL3812 Project Appraisal	Semester 1
CIVL5266 **Steel Structures - Stability**	6		Semester 1
CIVL5269 **Concrete Structures - Strength & Service**	6		Semester 2
CIVL5351 **Environmental Geotechnics**	6		Semester 1
CIVL5452 **Foundation Engineering**	6	**A** BE or equivalent.	Semester 2
CIVL5458 **Numerical Methods in Civil Engineering**	6	**A** BE or equivalent.	Semester 1
CIVL5665 **Advanced Water Resources Management**	6	**A** Basic calculation skills and a knowledge of the application of spreadsheets to perform data manipulation and presentation.	Semester 2
CIVL5668 **Wind Engineering for Design-Fundamentals**	6	**A** BE or equivalent.	Semester 1

Notes

1. Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions.

2. For the BE (Civil) degree students must take at least 18 elective credit points of study from the recommended Civil Third Year level and 18 elective credit points from the recommended Civil Fourth Year electives. The remaining 12 credit points can be obtained from any of the listed elective units or from units of study in other Faculties subject to approval from the Director of the Learning and Teaching, Civil Engineering.

Exchange units of study

CIVL0011, CIVL0012, CIVL0013, CIVL0014, CIVL0015, CIVL0016, CIVL0017 AND CIVL0018 are available for exchange study programs.

Project Engineering and Management (Civil) stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Project Engineering and Management (Civil)			
Candidates for the degree of Bachelor of Engineering in Project Engineering and Management (Civil) are required to gain credit points for the core units of study set out below. Any additional credit necessary to satisfy the degree requirement of not less than 192 credit points shall be gained by completing additional elective units of study, as recommended by the School (as set out below).			
Core units of study			
First year			
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
ACCT1003 **Financial Accounting Concepts**	6	**N** ACCT1001, ACCT1002 *Terminating unit.*	Semester 1
ACCT1004 **Management Accounting Concepts**	6	**N** ACCT1001, ACCT1002 *Terminating unit.*	Semester 2
ENGG1800 **Engineering Disciplines (Intro) Stream A**	6		Semester 1
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
ENGG1803 **Professional Engineering 1**	6		Semester 1 Semester 2
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics **C** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) **N** PHYS1002, PHYS1901, EDUH1017	Semester 1
Second year			
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
CIVL2201 **Structural Mechanics**	6	**P** ENGG1802 Engineering Mechanics **N** AMME2301	Semester 1
CIVL2810 **Engineering Construction and Surveying**	6	**A** MATH1001, MATH1002, MATH1003, MATH1005	Semester 1
CIVL2230 **Intro to Structural Concepts and Design**	6	**A** ENGG1802 Engineering Mechanics, CIVL2110 Materials CIVL2201 Structural Mechanics	Semester 2
CIVL2410 **Soil Mechanics**	6	**A** CIVL2201 Structural Mechanics	Semester 2
CIVL2611 **Introductory Fluid Mechanics**	6	**A** MATH1001 Differential Calculus, ENGG1802 Engineering Mechanics, CIVL2201 Structural Mechanics	Semester 2
CIVL3805 **Project Scope, Time and Cost Management**	6	**A** CIVL2810 - Engineering Construction and Surveying **P** 36 Intermediate credit points	Semester 2
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
Third year			
CIVL3010 **Engineering and Society**	6	**A** ENGG1803 Professional Engineering	Semester 1
CIVL2110 **Materials**	6	**N** AMME2302	Semester 1
CIVL3812 **Project Appraisal**	6	**A** MATH1005	Semester 1
CIVL3813 **Contracts Formulation and Management**	6	**A** CIVL3805 Project Scope, Cost & Time Management **P** 36 Intermediate (2nd year) credit points	Semester 2
CIVL4810 **Mgmnt of People, Quality and Risk in PE**	6	**A** CIVL3805 Project Scope, Time and Cost Management	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Fourth year			
CIVL4811 **Engineering Design and Construction**	6	**A** CIVL2810 Engineering Construction and Survey	Semester 1
CIVL4814 **Project Procurement and Tendering**	6	**A** CIVL3805 Project Scope, Time and Cost Management	Semester 2
CIVL4815 **Project Formulation**	6	**P** CIVL3805 Project Scope, Time and Cost Management, CIVL3812 Project Appraisal	Semester 1
ENGG4000 **Practical Experience**		**P** 36 Credit Points of Senior Units *Students should have completed three years of their BE program before enrolling in this unit.*	Semester 1 Semester 2
Students must select 12cp from the following block of units. Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
CIVL4022 **Honours Thesis A**	6	**P** 30 credit points of Senior Units of Study, ISWAM 65 or over *Note: Department permission required for enrolment*	Semester 1 Semester 2
CIVL4023 **Honours Thesis B**	6	**P** 30 credit points of Senior units of study and successful completion of CIVL4022 - Honours Thesis A *Note: Department permission required for enrolment*	Semester 1 Semester 2
CIVL4024 **Engineering Project A**	6	**P** 30 Credit Points of Senior Units of Study *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
CIVL4025 **Engineering Project B**	6	**P** 30 Credit Points of Senior Units of Study and successful completion of CIVL4024 Engineering Project A **N** CIVL4022, CIVL4023 *Note: Department permission required for enrolment in the following sessions: Semester 1*	Semester 1 Semester 2

Notes.

1. Students in the Honours program must enrol in CIVL4022 & CIVL4023, students in the Pass Program must enrol in CIVL4024 & CIVL4025.

2. With special permission from the Director of the Learning and Teaching, Civil Engineering, it is possible to take Honours Thesis A or Engineering Project A in Semester 2 and Honours Thesis B or Engineering Project B in Semester 1.

3. For core units of study offered by other than the Faculty of Engineering, any assumed knowledge, prerequisite and corequisite requirements will be as prescribed by the faculty.

4. Candidates for the degree of Bachelor of Engineering in Project Engineering and Management (Civil) are expected to complete all the core units of study (156 credit points). They are also required to gain at least 24 credit points from the third and fourth year table of electives listed below. The remaining 12 credit points required for the degree can be obtained from the list of electives below or from other units of study offered by the University of Sydney subject to approval by the Director of the Learning and Teaching of Civil Engineering.

5. Candidates commencing a combined degree program that is a Bachelor of Engineering in Project Engineering and Management (Civil) with Bachelor of Commerce are required to complete all of the core units of study in the above specialisation requirements except for ACCT1003, ACCT1004, which are not required, therefore only 144 credit points are needed. This total of 144 credit points is only sufficient to be awarded a Bachelor of Engineering in Project Engineering and Management (Civil) as part of an approved combined degree program. The remaining 96 credit points for the combined degree will be taken in the Faculty of Economics and Business. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Economics and Business.

6. Candidates commencing a combined degree program that is a Bachelor of Engineering in Project Engineering and Management (Civil) with Bachelor of Arts, Bachelor of Science, or Bachelor of Medical Science are required to complete all of the core units of study in the above specialisation requirements. This remaining 84 credit points should be taken from the relevant faculty unit of study subject to the Joint Resolutions of the Faculty of Engineering and the relevant faculty.

7. Candidates commencing a combined degree program that is a Bachelor of Engineering in Project Engineering and Management (Civil) with Bachelor of Laws are required to complete all of the core units of study in the above specialisation requirements except CIVL3010 and CIVL3813. The remaining 144 credit points for the combined degree will be taken in the Faculty of Laws. Candidates should refer to the Joint Resolutions of the Faculty of Engineering and the Faculty of Laws.

8. Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by equivalent advanced level units of study subject to prerequisite conditions (as required by the Faculty of Science) being met. Students considering doing advanced options should seek advice from the relevant department before enrolling.

Recommended elective units of study

Third year

CIVL3205 **Concrete Structures 1**	6	**A** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design	Semester 1
CIVL3612 **Fluid Mechanics**	6	**A** ENGG1802 Engineering Mechanics, MATH2061 - Linear Mathematics and Vector Calculus, CIVL2201 - Structural Mechanics, CIVL2611 - Fluid Mechanics: Inviscid Flow	Semester 1
CIVL3206 **Steel Structures 1**	6	**A** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design	Semester 2
CIVL3235 **Structural Analysis**	6	**A** CIVL2110, CIVL2230 and MATH2061	Semester 2
CIVL3411 **Geotechnical Engineering**	6	**A** CIVL2410 Soil Mechanics	Semester 2
CIVL3613 **Ocean and Coastal Engineering**	6	**A** CIVL2611 - Fluid Mechanics: Inviscid Flow *Note: Department permission required for enrolment*	Semester 2
CIVL2511 **Instrumentation and Measurement**	6	**A** CIVL2201 Structural Mechanics, ENGG1802 Engineering Mechanics	Semester 2

Fourth year

CIVL4614 **Flow-Induced Vibrations** *This unit of study is not available in 2011*	6	**A** CIVL2611 Fluid Mechanics: Inviscid Flow, CIVL3612 Environmental Fluids Engineering: Viscous Flow, CIVL2230 Introduction to Structural Concepts and Design, CIVL3235 Structural Analysis *Note: Department permission required for enrolment*	Semester 1
CIVL4615 **Water Resources and Hydrology** *This unit of study is not available in 2011*	6	**A** ENGG1802 - Engineering Mechanics, MATH2061 - Linear Mathematics and Vector Calculus, CIVL2611 - Fluid Mechanics: Inviscid Flow, CIVL3612 - Environmental and Fluid Engineering: Viscous Flow	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
CIVL4903 Civil Engineering Design	6	**A** CIVL3205 Concrete Structures 1 and CIVL3206 Steel Structures 1.	Semester 2
CIVL5266 Steel Structures - Stability	6		Semester 1
CIVL5269 Concrete Structures - Strength & Service	6		Semester 2
CIVL5351 Environmental Geotechnics	6		Semester 1
CIVL5458 Numerical Methods in Civil Engineering	6	**A** BE or equivalent.	Semester 1

Notes

1. Choice of electives as shown in the above table will depend upon subject availability, timetabling and prerequisite conditions.

3. At least one of CIVL3205 and CIVL3612 must be taken.

Exchange units of study

CIVL0011, CIVL0012, CIVL0013, CIVL0014, CIVL0015, CIVL0016, CIVL0017 AND CIVL0018 are available for exchange study programs.

Civil Engineering Combined with Design in Architecture degree requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Civil Engineering combined with Design in Architecture			
Candidates for the degree of Bachelor of Engineering in Civil Engineering and Design in Architecture are required to gain credit for the core units of study set out below. To satisfy the degree requirement of the combined degree a candidate must study not less than 144 credit points of the core civil engineering units of study and 96 credit points of units of study of the core design in architecture untis of study.			
Core units of study			
First year			
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
BDES1010 **Architecture Studio 101**	6	**A** HSC Mathematics and HSC English Standard or equivalent **C** BDES1011, BDES1012 **N** DESA1001	Semester 1
BDES1011 **Architectural History/Theory 1**	6	**A** HSC Mathematics and HSC English Standard or equivalent **N** DESA1102	Semester 1
BDES1012 **Architectural Communications 1**	6	**A** HSC Mathematics and HSC English Standard or equivalent **C** BDES1010, BDES1011 **N** DESA1001	Semester 1
BDES1020 **Architecture Studio 102**	6	**A** BDES1011, BDES1012 **P** BDES1010 or DESA1001 **C** BDES1023, BDES1024 **N** DESA1002	Semester 2
BDES1023 **Architectural Technologies 1**	6	**C** BDES1020, BDES1024 **N** DESA1102	Semester 2
BDES1024 **Art Workshop 1**	6	**C** BDES1020, BDES1023	Semester 2
Second year			
ENGG1800 **Engineering Disciplines (Intro) Stream A**	6		Semester 1
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main
ENGG1803 **Professional Engineering 1**	6		Semester 1 Semester 2
INFO1003 **Foundations of Information Technology**	6	**N** INFO1000 or INFS1000	Semester 1 Semester 2
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics **C** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) **N** PHYS1002, PHYS1901, EDUH1017	Semester 1
CIVL2201 **Structural Mechanics**	6	**P** ENGG1802 Engineering Mechanics **N** AMME2301	Semester 1
GEOL1501 **Engineering Geology 1**	6	**A** No previous knowledge of Geology assumed **N** GEOL1002, GEOL1902, GEOS1003, GEOS1903	Semester 2
Third year			
CIVL2201 **Structural Mechanics**	6	**P** ENGG1802 Engineering Mechanics **N** AMME2301	Semester 1
CIVL2410 **Soil Mechanics**	6	**A** CIVL2201 Structural Mechanics	Semester 2
CIVL2611 **Introductory Fluid Mechanics**	6	**A** MATH1001 Differential Calculus, ENGG1802 Engineering Mechanics, CIVL2201 Structural Mechanics	Semester 2
BDES2010 **Architecture Studio 201**	6	**P** BDES1020 or DESA1002 **C** BDES2012, BDES2013 **N** DESA2001	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
BDES2012 **Architectural Communications 2**	6	**A** BDES1012 **C** BDES2010, BDES2013 **N** DESA2001 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
BDES2013 **Architectural Technologies 2**	6	**A** BDES1023 **C** BDES2010, BDES2012 **N** DESA2111	Semester 1
BDES2020 **Architecture Studio 202**	6	**P** BDES2010 or DESA2001 **C** BDES2021, BDES2024 **N** DESA2002	Semester 2
BDES2021 **Architectural History/Theory 2**	6	**P** BDES1011 **N** DESA2111	Semester 2
Fourth year			
CIVL2810 **Engineering Construction and Surveying**	6	**A** MATH1001, MATH1002, MATH1003, MATH1005	Semester 1
CIVL3812 **Project Appraisal**	6	**A** MATH1005	Semester 1
CIVL3206 **Steel Structures 1**	6	**A** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design	Semester 2
CIVL3235 **Structural Analysis**	6	**A** CIVL2110, CIVL2230 and MATH2061	Semester 2
BDES3010 **Architecture Studio 301**	6	**P** BDES1010, BDES1011, BDES1012, BDES1020, BDES1023, BDES1024, BDES2010, BDES2013, BDES2012, BDES2020, BDES2021, BDES2024 or the equivalents from DESA1001,DESA1002,DESA1101,DESA1102, DESA2001,DESA2002,DESA2111 **C** BDES3011, BDES3012 **N** DESA3001 *Progression to BDES3010 requires successful completion of all preceding BDES10XX and BDES20XX units of study or the successful completion of all preceding Design Practice and Design Studies units of study.*	Semester 1
BDES3012 **Architectural Communications 3**	6	**P** BDES2012 or DESA2002 **C** BDES3010 and (BDES3011 or DAAP3001) **N** DESA3001	Semester 1
BDES3020 **Architecture Studio 302**	6	**P** BDES3010 or DESA3001 **C** BDES3023 or DAAP3002 **N** DESA3002	Semester 2
BDES3023 **Architectural Technologies 3**	6	**P** BDES2013 or DESA2111 **C** BDES3020 **N** DAAP3002	Semester 2
Fifth Year			
CIVL3205 **Concrete Structures 1**	6	**A** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design	Semester 1
CIVL3612 **Fluid Mechanics**	6	**A** ENGG1802 Engineering Mechanics, MATH2061 - Linear Mathematics and Vector Calculus, CIVL2201 - Structural Mechanics, CIVL2611 - Fluid Mechanics: Inviscid Flow	Semester 1
CIVL4811 **Engineering Design and Construction**	6	**A** CIVL2810 Engineering Construction and Survey	Semester 1
CIVL4903 **Civil Engineering Design**	6	**A** CIVL3205 Concrete Structures 1 and CIVL3206 Steel Structures 1.	Semester 2
ENGG4000 **Practical Experience**		**P** 36 Credit Points of Senior Units *Students should have completed three years of their BE program before enrolling in this unit.*	Semester 1 Semester 2
BDES3025 **Architectural Professional Practice**	6	**C** BDES3020	Semester 2
An additional 6 credit point core unit of study in structural design, CIVL4860, will become available in fifth year in 2012.			
Students must select 12cp from the following block of units. Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
CIVL4022 **Honours Thesis A**	6	**P** 30 credit points of Senior Units of Study, ISWAM 65 or over *Note: Department permission required for enrolment*	Semester 1 Semester 2
CIVL4023 **Honours Thesis B**	6	**P** 30 credit points of Senior units of study and successful completion of CIVL4022 - Honours Thesis A *Note: Department permission required for enrolment*	Semester 1 Semester 2
CIVL4024 **Engineering Project A**	6	**P** 30 Credit Points of Senior Units of Study *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
CIVL4025 **Engineering Project B**	6	**P** 30 Credit Points of Senior Units of Study and successful completion of CIVL4024 Engineering Project A **N** CIVL4022, CIVL4023 *Note: Department permission required for enrolment in the following sessions: Semester 1*	Semester 1 Semester 2
Resolutions of the Faculty of Engineering and IT relating to the combined Civil Engineering/Design in Architecture program.			
1. Candidates for the degrees of Bachelor of Engineering in Civil Engineering and Bachelor of Design in Architecture must complete all the core units of the study as listed in the above table and complete a minimum of 240 credit points.			
2. Most Mathematics, Chemistry, Physics and Computer Science units of study offered by the Faculty of Science can be replaced by an equivalent advanced level units of study subject to prerequisite conditions (as required by the Faculty of Science) being met.			
4. Students considering doing Advanced Engineering options should seek advice from the relevant school adviser before enrolling.			

5.4 School of Electrical and Information Engineering

The School of Electrical and Information Engineering offers the following Bachelor of Engineering degree specialisations:

- Electrical
- Electrical (Bioelectronics)
- Electrical (Computer)
- Electrical (Power)
- Electrical (Telecommunications)
- Software, and
- Combined degrees with Science, Commerce, Arts, Medical Science and Law.

Candidates for the degree of Bachelor of Engineering in Electrical Engineering, Electrical (Bioelectronics), Electrical (Computer), Electrical (Power), Electrical (Telecommunications) and Software Engineering are required to gain credit for a prescribed number of credit points of core and recommended units of study. The core units of study are set out in the tables below pertaining to each specialisation. The recommended units of study are as defined for each specialisation.

Note: Not all recommended units of study shall be available each year.

Electrical Engineering stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Electrical Engineering			
All candidates for the Bachelor of Engineering in Electrical Engineering degree (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study. Candidates will also need to choose a number of recommended units of study for Electrical Engineering, which consist of: – all level 3, 4 and 5 ELEC units which do not appear in the table of core units; and – such other units of study as may be so designated by the Head of School.			
Bachelor of Engineering in Electrical Engineering			
Candidates for the 4-year Bachelor of Engineering in Electrical Engineering degree are required to complete a total of not less than 192 credit points including at least 168 credit points made up of units from the table of core units and recommended units of study. The additional 24 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.			
Bachelor of Engineering in Electrical Engineering in a combined degree course			
Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering with the Bachelor of Commerce or Bachelor of Laws are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study. Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering with the Bachelor of Science or Bachelor of Arts are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study. Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering with the Bachelor of Medical Science are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study, but may choose to replace up to 12 credit points of recommended units with CHEM1101 Chemistry 1A and BIOL1001 Concepts in Biology. Candidates in all combined degree courses shall also satisfy such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and Information Technologies and the second faculty concerned.			
Electrical Engineering core units of study			
First year			
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
ENGG1805 **Professional Engineering and IT**	6		Semester 1
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
PHYS1003 **Physics 1 (Technological)**	6	**A** HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. **C** Recommended concurrent Units of Study: MATH (1003/1903), MATH (1005/1905). **N** PHYS1004, PHYS1902 *It is recommended that PHYS (1001 or 1002 or 1901) be completed before this unit*	Semester 2
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Second year			
ELEC2103 **Simulation & Numerical Solutions in Eng**	6	**A** ELEC1103 Fundamentals of Electrical and Electronic Engineering, ELEC1601 Foundations of Computer Systems. **N** COSC1001, COSC1901	Semester 2
ELEC2104 **Electronic Devices and Circuits**	6	**A** ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. **N** ELEC2401	Semester 2
ELEC2302 **Signals and Systems**	6	**A** MATH1001 Differential Calculus and MATH1002 Linear Algebra and MATH1003 Integral Calculus and Modelling. **N** ELEC2301, MATH3019, MATH3919	Semester 2
ELEC2602 **Digital System Design**	6	**A** ELEC1103 **N** ELEC3601, ELEC3608	Semester 1
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics **C** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) **N** PHYS1002, PHYS1901, EDUH1017	Semester 1
PHYS2213 **Physics 2EE**	6	**A** MATH (1001/1901 and 1002/1902 and 1003/1903). MATH (1005/1905) would also be useful **P** PHYS (1001 or 1901) and PHYS (1003 or 1902) **N** PHYS2203, PHYS2001, PHYS2901, PHYS2011, PHYS2911, PHYS2002, PHYS2902, PHYS2012, PHYS2912	Semester 2
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1
Third year			
At least 5 of the following 9 units of study:			
ELEC3104 **Engineering Electromagnetics**	6	**A** Differential calculus, integral calculus, vector integral calculus; electrical circuit theory and analysis using lumped elements; fundamental electromagnetic laws and their use in the calculation of static fields. **N** ELEC3102	Semester 1
ELEC3203 **Electricity Networks**	6	**A** This unit of study assumes a competence in first year mathematics (in particular, the ability to work with complex numbers), in elementary circuit theory and in basic electromagnetics. **N** ELEC3201	Semester 2
ELEC3206 **Electrical Energy Conversion Systems**	6	**A** Following concepts are assumed knowledge for this unit of study: familiarity with circuit theory, electronic devices, ac power, capacitors and inductors, and electric circuits such as three-phase circuits and circuits with switches, the use of basic laboratory equipment such as oscilloscope and power supply. **P** ELEC2104	Semester 1
ELEC3304 **Control**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform. **P** MATH2061 and ELEC2302 **N** ELEC3302, AMME3500	Semester 2
ELEC3305 **Digital Signal Processing**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, continuous linear time-invariant systems and their time and frequency domain representations, Fourier transform, sampling of continuous time signals. **P** ELEC2302 **N** ELEC3303	Semester 1
ELEC3404 **Electronic Circuit Design**	6	**A** A background in basic electronics and circuit theory is assumed. **N** ELEC3401	Semester 1
ELEC3505 **Communications**	6	**A** Confidence in mathematical operation usually needed to handle telecommunications problems such as Fourier transform, fundamental in signals and systems theory, convolution, and similar techniques. **N** ELEC3503	Semester 1
ELEC3607 **Embedded Computing**	6	**A** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **P** ELEC1601 and ELEC2602 **N** ELEC2601	Semester 1
ELEC3702 **Management for Engineers**	6	**N** ELEC3701, ENGG3005, MECH3661	Semester 2
Fourth year			
ELEC4702 **Practical Experience**		**P** 24 credit points of level 3 or 4 units of study.	Semester 1 Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Students must select 12cp from the following block of units.			
Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
ELEC4710 **Engineering Project A**	6	**P** 36 credit points of units of study from level 3 and above. **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
ELEC4711 **Engineering Project B**	6	**A** 36 credit points of units of study from level 3 and above **P** ELEC4710 Engineering Project A **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4712 **Honours Thesis A**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4713 **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4713 **Honours Thesis B**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4712 **N** ELEC4707, ELEC4711 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Notes			
1. The Mathematics, Physics and Information Technology units of study may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met.			
2. Students in the Honours program must enrol in ELEC4712 & ELEC4713, students in the Pass Program must enrol in ELEC4710 & ELEC4711.			

Electrical Engineering (Bioelectronics) stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Electrical Engineering (Bioelectronics)			
All candidates for the Bachelor of Engineering in Electrical Engineering (Bioelectronics) degree (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study. Candidates will also need to choose a number of recommended units of study for Electrical (Bioelectronics) Engineering, which consist of: – all level 3, 4 and 5 ELEC units which do not appear in the table of core units; - the units of study listed in the table of additional recommended units of study; and – such other units of study as may be so designated by the Head of School.			
Bachelor of Engineering in Electrical (Bioelectronics) Engineering			
Candidates for the 4-year Bachelor of Engineering in Electrical Engineering (Bioelectronics) degree are required to complete a total of not less than 192 credit points including at least 168 credit points made up of units from the table of core units and recommended units of study. The additional 24 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.			
Bachelor of Engineering in Electrical Engineering (Bioelectronics) in a combined degree course			
Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering (Bioelectronics) with the Bachelor of Commerce or Bachelor of Laws are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study. Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering (Bioelectronics) with the Bachelor of Science or Bachelor of Arts are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study. Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering (Bioelectronics) with the Bachelor of Medical Science are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study, but may choose to replace up to 12 credit points of recommended units with CHEM1101 Chemistry 1A and BIOL1001 Concepts in Biology. Candidates in all combined degree courses shall also satisfy such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and Information Technologies and the second faculty concerned.			
Electrical Engineering (Bioelectronics) core units of study			
First year			
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
ENGG1805 **Professional Engineering and IT**	6		Semester 1
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
PHYS1003 **Physics 1 (Technological)**	6	**A** HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. **C** Recommended concurrent Units of Study: MATH (1003/1903), MATH (1005/1905). **N** PHYS1004, PHYS1902 *It is recommended that PHYS (1001 or 1002 or 1901) be completed before this unit*	Semester 2
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Second year			
BIOL1003 **Human Biology**	6	**A** HSC 2-unit Biology. Semester 1 students who have not completed HSC biology (or equivalent) are strongly advised to take the Biology Bridging Course (in February). **N** BIOL1903 *It is recommended that BIOL (1001 or 1911) be taken concurrently with this unit of study.*	Semester 1 Summer Main
ELEC2103 **Simulation & Numerical Solutions in Eng**	6	**A** ELEC1103 Fundamentals of Electrical and Electronic Engineering, ELEC1601 Foundations of Computer Systems. **N** COSC1001, COSC1901	Semester 2
ELEC2104 **Electronic Devices and Circuits**	6	**A** ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. **N** ELEC2401	Semester 2
ELEC2302 **Signals and Systems**	6	**A** MATH1001 Differential Calculus and MATH1002 Linear Algebra and MATH1003 Integral Calculus and Modelling. **N** ELEC2301, MATH3019, MATH3919	Semester 2
ELEC2602 **Digital System Design**	6	**A** ELEC1103 **N** ELEC3601, ELEC3608	Semester 1
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics **C** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) **N** PHYS1002, PHYS1901, EDUH1017	Semester 1
MECH2901 **Anatomy and Physiology for Engineers**	6	**A** A basic understanding of biology. Recommended: BIOL1003 (or equivalent)	Semester 2
Third year			
ELEC3304 **Control**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform. **P** MATH2061 and ELEC2302 **N** ELEC3302, AMME3500	Semester 2
ELEC3305 **Digital Signal Processing**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, continuous linear time-invariant systems and their time and frequency domain representations, Fourier transform, sampling of continuous time signals. **P** ELEC2302 **N** ELEC3303	Semester 1
ELEC3404 **Electronic Circuit Design**	6	**A** A background in basic electronics and circuit theory is assumed. **N** ELEC3401	Semester 1
ELEC3607 **Embedded Computing**	6	**A** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **P** ELEC1601 and ELEC2602 **N** ELEC2601	Semester 1
ELEC3802 **Fundamentals of Biomedical Engineering**	6	**A** A knowledge of basic electrical engineering is required: Ohm's law, Thevenin and Nortons' theorems, basic circuit theory involving linear resistors, capacitors and inductors, a basic knowledge of bipolar and field effect transistor theory, simplified theoretical mechanism of operation of transformers. **N** ELEC3801	Semester 1
The core unit ELEC3803 Bioelectronics will be available to students in this program in 2012			
Fourth year			
ELEC4702 **Practical Experience**		**P** 24 credit points of level 3 or 4 units of study.	Semester 1 Semester 2
Students must select 12cp from the following block of units. Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
ELEC4710 **Engineering Project A**	6	**P** 36 credit points of units of study from level 3 and above. **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
ELEC4711 **Engineering Project B**	6	**A** 36 credit points of units of study from level 3 and above **P** ELEC4710 Engineering Project A **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4712 **Honours Thesis A**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4713 **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4713 **Honours Thesis B**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4712 **N** ELEC4707, ELEC4711 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Notes 1. The Mathematics, Physics and Information Technology units of study may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met. 2. Students in the Honours program must enrol in ELEC4712 & ELEC4713, students in the Pass Program must enrol in ELEC4710 & ELEC4711.			
Additional Recommended Elective Bioelectronics Units of Study			
AMME4990 **Biomedical Product Development**	6	**A** Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level. **P** 6 credit points of junior biology 6 credit points of junior chemistry MECH2901 or 6 credit points of intermediate physiology or equivalent MECH3921	Semester 1
AMME4992 **Regulatory Affairs in Medical Industry**	6	**A** Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level. **P** 6 credit points of junior biology 6 credit points of junior chemistry MECH2901 or 6 credit points of intermediate physiology or equivalent MECH3921	Semester 2

Electrical Engineering (Computer) stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Electrical Engineering (Computer)			
All candidates for the Bachelor of Engineering in Electrical Engineering (Computer) degree (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study.			
Candidates will also need to choose a number of recommended units of study for Electrical Engineering (Computer), which consist of:			
– all level 3, 4 and 5 ELEC units which do not appear in the table of core units; and			
– such other units of study as may be so designated by the Head of School.			
Bachelor of Electrical Engineering (Computer)			
Candidates for the four-year Bachelor of Engineering in Electrical Engineering (Computer) degree are required to complete a total of not less than 192 credit points including at least 168 credit points made up of units from the table of core units and recommended units of study. The additional 24 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.			
Bachelor of Engineering in Electrical Engineering (Computer) in a combined degree course			
Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering (Computer) with the Bachelor of Commerce or Bachelor of Law are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study.			
Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering (Computer) with the Bachelor of Science or Bachelor of Arts are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study.			
Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering (Computer) with the Bachelor of Medical Science are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study, but may choose to replace up to 12 credit points of recommended units with CHEM1101 Chemistry 1A and BIOL1001 Concepts in Biology.			
Candidates in all combined degree courses shall also satisfy such other requirements as are prescribed in the joint resolutions of the Faculty of Engineering and Information Technologies and the second faculty concerned.			
Electrical Engineering (Computer) core units of study			
First year			
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
ENGG1805 **Professional Engineering and IT**	6		Semester 1
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
PHYS1003 **Physics 1 (Technological)**	6	**A** HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. **C** Recommended concurrent Units of Study: MATH (1003/1903), MATH (1005/1905). **N** PHYS1004, PHYS1902 *It is recommended that PHYS (1001 or 1002 or 1901) be completed before this unit*	Semester 2
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Second year			
ELEC2103 **Simulation & Numerical Solutions in Eng**	6	**A** ELEC1103 Fundamentals of Electrical and Electronic Engineering, ELEC1601 Foundations of Computer Systems. **N** COSC1001, COSC1901	Semester 2
ELEC2104 **Electronic Devices and Circuits**	6	**A** ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. **N** ELEC2401	Semester 2
ELEC2302 **Signals and Systems**	6	**A** MATH1001 Differential Calculus and MATH1002 Linear Algebra and MATH1003 Integral Calculus and Modelling. **N** ELEC2301, MATH3019, MATH3919	Semester 2
ELEC2602 **Digital System Design**	6	**A** ELEC1103 **N** ELEC3601, ELEC3608	Semester 1
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics **C** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) **N** PHYS1002, PHYS1901, EDUH1017	Semester 1
PHYS2213 **Physics 2EE**	6	**A** MATH (1001/1901 and 1002/1902 and 1003/1903). MATH (1005/1905) would also be useful **P** PHYS (1001 or 1901) and PHYS (1003 or 1902) **N** PHYS2203, PHYS2001, PHYS2901, PHYS2011, PHYS2911, PHYS2002, PHYS2902, PHYS2012, PHYS2912	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1
Third year			
ELEC3506 **Data Communications and the Internet**	6	**N** NETS2150, NETS2009, NETS2909, NETS3007, NETS3907, ELEC3504, ELEC4501	Semester 2
ELEC3607 **Embedded Computing**	6	**A** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **P** ELEC1601 and ELEC2602 **N** ELEC2601	Semester 1
ELEC3608 **Computer Architecture**	6	**A** Basic knowledge of digital logic is required. **P** ELEC2602	Semester 2
At least 2 of the following 6 units of study:			
ELEC3104 **Engineering Electromagnetics**	6	**A** Differential calculus, integral calculus, vector integral calculus; electrical circuit theory and analysis using lumped elements; fundamental electromagnetic laws and their use in the calculation of static fields. **N** ELEC3102	Semester 1
ELEC3304 **Control**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform. **P** MATH2061 and ELEC2302 **N** ELEC3302, AMME3500	Semester 2
ELEC3305 **Digital Signal Processing**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, continuous linear time-invariant systems and their time and frequency domain representations, Fourier transform, sampling of continuous time signals. **P** ELEC2302 **N** ELEC3303	Semester 1
ELEC3404 **Electronic Circuit Design**	6	**A** A background in basic electronics and circuit theory is assumed. **N** ELEC3401	Semester 1
ELEC3702 **Management for Engineers**	6	**N** ELEC3701, ENGG3005, MECH3661	Semester 2
COMP3520 **Operating Systems Internals**	6	**A** COMP2129, INFO1105 **N** NETS3304, NETS3604, NETS3009, NETS3909, COMP3009, COMP3909	Semester 1
Fourth year			
ELEC4605 **Computer Architecture** *This unit of study is not available in 2011*	6	**A** Logic operations, theorems and Boolean algebra, data representation, number operations (binary, hex, integers and floating point), combinational logic analysis and synthesis, sequential logic, registers, counters, bus systems, state machines, simple CAD tools for logic design, basic computer organisation, the CPU, peripheral devices, software organisation, machine language, assembly language, operating systems, data communications and computer networks, microprocessors and their use, the architecture, programming and interfacing of microcomputers, peripheral devices and chips, data acquisition, device monitoring and control and other communications. **P** ELEC1601, ELEC 2602 and ELEC3607 **N** ELEC4601 Computer Design.	Semester 1
ELEC4702 **Practical Experience**		**P** 24 credit points of level 3 or 4 units of study.	Semester 1 Semester 2
Students must select 12cp from the following block of units. Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
ELEC4710 **Engineering Project A**	6	**P** 36 credit points of units of study from level 3 and above. **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
ELEC4711 **Engineering Project B**	6	**A** 36 credit points of units of study from level 3 and above **P** ELEC4710 Engineering Project A **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4712 **Honours Thesis A**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4713 **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4713 **Honours Thesis B**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4712 **N** ELEC4707, ELEC4711 *Note: Department permission required for enrolment*	Semester 1 Semester 2

Notes

1. The Mathematics, Physics and Information Technology units of study may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met.

2. Students in the Honours program must enrol in ELEC4712 & ELEC4713, students in the Pass Program must enrol in ELEC4710 & ELEC4711.

Electrical Engineering (Power) stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Electrical Engineering (Power)			
All candidates for the Bachelor of Engineering in Electrical Engineering (Power) degree (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study. Candidates will also need to choose a number of recommended units of study for Electrical Engineering (Power), which consist of: – all level 3, 4 and 5 ELEC units which do not appear in the table of core units; and – such other units of study as may be so designated by the Head of School.			
Bachelor of Engineering in Electrical Engineering (Power)			
Candidates for the 4-year Bachelor of Engineering in Electrical Engineering (Power) degree are required to complete a total of not less than 192 credit points including at least 168 credit points made up of units from the table of core units and recommended units of study. The additional 24 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.			
Bachelor of Engineering in Electrical Engineering (Power) in a combined degree course			
Candidates in the combined degree course of Bachelor of Electrical Engineering (Power) with the Bachelor of Commerce or Bachelor of Law are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study. Candidates in the combined degree course of Bachelor of Electrical Engineering (Power) with the Bachelor of Science or Bachelor of Arts are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study. Candidates in the combined degree course of Bachelor of Electrical (Power) with the Bachelor of Medical Science are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study, but may choose to replace up to 12 credit points of recommended units with CHEM1101 Chemistry 1A and BIOL1001 Concepts in Biology. Candidates in all combined degree courses shall also satisfy such other requirements as are prescribed in the joint resolutions of the Faculty of Engineering and Information Technologies and the second faculty concerned.			
Electrical Engineering (Power) core units of study			
First year			
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
ENGG1805 **Professional Engineering and IT**	6		Semester 1
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
PHYS1003 **Physics 1 (Technological)**	6	**A** HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. **C** Recommended concurrent Units of Study: MATH (1003/1903), MATH (1005/1905). **N** PHYS1004, PHYS1902 *It is recommended that PHYS (1001 or 1002 or 1901) be completed before this unit*	Semester 2
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Second year			
ELEC2103 **Simulation & Numerical Solutions in Eng**	6	**A** ELEC1103 Fundamentals of Electrical and Electronic Engineering, ELEC1601 Foundations of Computer Systems. **N** COSC1001, COSC1901	Semester 2
ELEC2104 **Electronic Devices and Circuits**	6	**A** ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. **N** ELEC2401	Semester 2
ELEC2302 **Signals and Systems**	6	**A** MATH1001 Differential Calculus and MATH1002 Linear Algebra and MATH1003 Integral Calculus and Modelling. **N** ELEC2301, MATH3019, MATH3919	Semester 2
ELEC2602 **Digital System Design**	6	**A** ELEC1103 **N** ELEC3601, ELEC3608	Semester 1
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics **C** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) **N** PHYS1002, PHYS1901, EDUH1017	Semester 1
PHYS2213 **Physics 2EE**	6	**A** MATH (1001/1901 and 1002/1902 and 1003/1903). MATH (1005/1905) would also be useful **P** PHYS (1001 or 1901) and PHYS (1003 or 1902) **N** PHYS2203, PHYS2001, PHYS2901, PHYS2011, PHYS2911, PHYS2002, PHYS2902, PHYS2012, PHYS2912	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1
Third year			
ELEC3203 **Electricity Networks**	6	**A** This unit of study assumes a competence in first year mathematics (in particular, the ability to work with complex numbers), in elementary circuit theory and in basic electromagnetics. **N** ELEC3201	Semester 2
ELEC3204 **Power Electronics and Applications**	6	**A** Differential equations, linear algebra, complex variables, analysis of linear circuits. Fourier theory applied to periodic and non-periodic signals. Software such as MATLAB to perform signal analysis and filter design. Familiarity with the use of basic laboratory equipment such as oscilloscope, function generator, power supply, etc. **P** ELEC2104 **N** ELEC3202	Semester 1
ELEC3206 **Electrical Energy Conversion Systems**	6	**A** Following concepts are assumed knowledge for this unit of study: familiarity with circuit theory, electronic devices, ac power, capacitors and inductors, and electric circuits such as three-phase circuits and circuits with switches, the use of basic laboratory equipment such as oscilloscope and power supply. **P** ELEC2104	Semester 1
ELEC3304 **Control**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform. **P** MATH2061 and ELEC2302 **N** ELEC3302, AMME3500	Semester 2
Fourth year			
ELEC4702 **Practical Experience**		**P** 24 credit points of level 3 or 4 units of study.	Semester 1 Semester 2
ELEC5205 **High Voltage Engineering**	6	**A** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals equivalent to ELEC3105 *Recommended: ELEC5204 Power Systems*	Semester 2
ELEC5204 **Power Systems Analysis and Protection**	6	**A** The unit assumes basic knowledge of circuits, familiarity with basic mathematics, competence with basic circuit theory and an understanding of three phase systems, transformers, transmission lines and associated modeling and operation of such equipment. **N** ELEC4201	Semester 1
Students must select 12cp from the following block of units. Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
ELEC4710 **Engineering Project A**	6	**P** 36 credit points of units of study from level 3 and above. **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
ELEC4711 **Engineering Project B**	6	**A** 36 credit points of units of study from level 3 and above **P** ELEC4710 Engineering Project A **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4712 **Honours Thesis A**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4713 **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4713 **Honours Thesis B**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4712 **N** ELEC4707, ELEC4711 *Note: Department permission required for enrolment*	Semester 1 Semester 2

Notes

1. The Mathematics, Physics and Information Technology units of study may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met.

2. Students in the Honours program must enrol in ELEC4712 & ELEC4713, students in the Pass Program must enrol in ELEC4710 & ELEC4711.

Electrical Engineering (Telecommunications) stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Electrical Engineering (Telecommunications)			
All candidates for the Bachelor of Engineering degree in Electrical Engineering (Telecommunications) (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study. Candidates will also need to choose a number of recommended units of study for Electrical Engineering (Telecommunications), which consist of: – all level 3, 4 and 5 ELEC units which do not appear in the table of core units; and – such other units of study as may be so designated by the Head of School.			
Bachelor of Engineering in Electrical Engineering (Telecommunications)			
Candidates for the 4-year Bachelor of Engineering in Electrical Engineering (Telecommunications) degree are required to complete a total of not less than 192 credit points including at least 168 credit points made up of units from the table of core units and recommended units of study. The additional 24 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.			
Bachelor of Engineering in Electrical Engineering (Telecommunications) in a combined degree course			
Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering (Telecommunications) with the Bachelor of Commerce or Bachelor of Law are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study. Candidates in the combined degree course of Bachelor of Engineering in Electrical Engineering (Telecommunications) with the Bachelor of Science or Bachelor of Arts are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study. Candidates in the combined degree course of Bachelor of Electrical Engineering (Telecommunications) with the Bachelor of Medical Science are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study, but may choose to replace up to 12 credit points of recommended units with CHEM1101 Chemistry 1A and BIOL1001 Concepts in Biology. Candidates in all combined degree courses shall also satisfy such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and Information Technologies and the second faculty concerned.			
Electrical Engineering (Telecommunications) core units of study			
First year			
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
ENGG1805 **Professional Engineering and IT**	6		Semester 1
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
PHYS1003 **Physics 1 (Technological)**	6	**A** HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. **C** Recommended concurrent Units of Study: MATH (1003/1903), MATH (1005/1905). **N** PHYS1004, PHYS1902 *It is recommended that PHYS (1001 or 1002 or 1901) be completed before this unit*	Semester 2
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Second year			
ELEC2103 **Simulation & Numerical Solutions in Eng**	6	**A** ELEC1103 Fundamentals of Electrical and Electronic Engineering, ELEC1601 Foundations of Computer Systems. **N** COSC1001, COSC1901	Semester 2
ELEC2104 **Electronic Devices and Circuits**	6	**A** ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. **N** ELEC2401	Semester 2
ELEC2302 **Signals and Systems**	6	**A** MATH1001 Differential Calculus and MATH1002 Linear Algebra and MATH1003 Integral Calculus and Modelling. **N** ELEC2301, MATH3019, MATH3919	Semester 2
ELEC2602 **Digital System Design**	6	**A** ELEC1103 **N** ELEC3601, ELEC3608	Semester 1
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics **C** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) **N** PHYS1002, PHYS1901, EDUH1017	Semester 1
PHYS2213 **Physics 2EE**	6	**A** MATH (1001/1901 and 1002/1902 and 1003/1903). MATH (1005/1905) would also be useful **P** PHYS (1001 or 1901) and PHYS (1003 or 1902) **N** PHYS2203, PHYS2001, PHYS2901, PHYS2011, PHYS2911, PHYS2002, PHYS2902, PHYS2012, PHYS2912	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1
Third year			
ELEC3305 **Digital Signal Processing**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, continuous linear time-invariant systems and their time and frequency domain representations, Fourier transform, sampling of continuous time signals. **P** ELEC2302 **N** ELEC3303	Semester 1
ELEC3405 **Communications Electronics and Photonics**	6	**A** ELEC2401 Introductory Electronics or ELEC2104 Electronic Devices and Basic Circuits. **N** ELEC3402	Semester 2
ELEC3505 **Communications**	6	**A** Confidence in mathematical operation usually needed to handle telecommunications problems such as Fourier transform, fundamental in signals and systems theory, convolution, and similar techniques. **N** ELEC3503	Semester 1
ELEC3506 **Data Communications and the Internet**	6	**N** NETS2150, NETS2009, NETS2909, NETS3007, NETS3907, ELEC3504, ELEC4501	Semester 2
At least 1 of the following 5 units of study:			
ELEC3104 **Engineering Electromagnetics**	6	**A** Differential calculus, integral calculus, vector integral calculus; electrical circuit theory and analysis using lumped elements; fundamental electromagnetic laws and their use in the calculation of static fields. **N** ELEC3102	Semester 1
ELEC3304 **Control**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform. **P** MATH2061 and ELEC2302 **N** ELEC3302, AMME3500	Semester 2
ELEC3404 **Electronic Circuit Design**	6	**A** A background in basic electronics and circuit theory is assumed. **N** ELEC3401	Semester 1
ELEC3607 **Embedded Computing**	6	**A** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **P** ELEC1601 and ELEC2602 **N** ELEC2601	Semester 1
ELEC3702 **Management for Engineers**	6	**N** ELEC3701, ENGG3005, MECH3661	Semester 2
Fourth year			
ELEC4505 **Digital Communication Systems**	6	**A** ELEC3505 Communications **N** ELEC4502	Semester 1
ELEC4702 **Practical Experience**		**P** 24 credit points of level 3 or 4 units of study.	Semester 1 Semester 2
Students must select 12cp from the following block of units. Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
ELEC4710 **Engineering Project A**	6	**P** 36 credit points of units of study from level 3 and above. **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
ELEC4711 **Engineering Project B**	6	**A** 36 credit points of units of study from level 3 and above **P** ELEC4710 Engineering Project A **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4712 **Honours Thesis A**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4713 **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4713 **Honours Thesis B**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4712 **N** ELEC4707, ELEC4711 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Notes 1. The Mathematics, Physics and Information Technology units of study may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met 2. Students in the Honours program must enrol in ELEC4712 & ELEC4713, students in the Pass Program must enrol in ELEC4710 & ELEC4711.			

Software Engineering stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Software Engineering			
All candidates for the Bachelor of Engineering degree in Software Engineering (including those enrolled in a combined degree) must satisfy the requirements described in the table of core units of study. Candidates will also need to choose a number of recommended units of study for Software Engineering, which consist of: – all level 1, 2, 3, 4 and 5 EIE and SIT units which do not appear in the table of core units; – the units of study listed in the table of additional recommended units of study; and – such other units of study as may be so designated by the Head of School.			
Bachelor of Engineering in Software Engineering			
Candidates for the 4-year Bachelor of Engineering in Software Engineering degree are required to complete a total of not less than 192 credit points including at least 168 credit points made up of units from the table of core units and recommended units of study with no more than 18 credit points of recommended elective units from level 1, and 2. The additional 24 credit points may consist, in whole or in part, of free elective units of study approved by the Head of School.			
Bachelor of Engineering in Software Engineering in a combined degree course			
Candidates in the combined degree course of Bachelor of Engineering in Software Engineering with the Bachelor of Commerce or Bachelor of Laws are required to complete at least 144 credit points made up of units from the table of core units and recommended units of study with no more than 18 credit points of recommended elective units from level 1, and 2. Candidates in the combined degree course of Bachelor of Engineering in Software Engineering with the Bachelor of Science or Bachelor of Arts are required to complete at least 156 credit points made up of units from the table of core units and recommended units of study with no more than 18 credit points of recommended elective units from level 1, and 2. Candidates in the combined degree course of Bachelor of Engineering in Software Engineering with the Bachelor of Medical Science are required to complete at least 156 credit points made up of units from the table of core units and recommended units of studywith no more than 18 credit points of recommended elective units from level 1, and 2, but may choose to replace up to 12 credit points of recommended units with CHEM1101 Chemistry 1A and BIOL1001 Concepts in Biology. Candidates in all combined degree courses shall also satisfy such other requirements for the combined course as are prescribed in the joint resolutions of the Faculty of Engineering and Information Technologies and the second faculty concerned.			
Software Engineering core units of study			
First year			
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
ENGG1805 **Professional Engineering and IT**	6		Semester 1
MATH1001 **Differential Calculus**	3	**A** HSC Mathematics Extension 1 **N** MATH1011, MATH1901, MATH1906, MATH1111	Semester 1 Summer Main
MATH1002 **Linear Algebra**	3	**A** HSC Mathematics Extension 1 **N** MATH1902, MATH1012, MATH1014	Semester 1 Summer Main
MATH1003 **Integral Calculus and Modelling**	3	**A** HSC Mathematics Extension 2 or MATH1001 or MATH1011 **N** MATH1013, MATH1903, MATH1907	Semester 2 Summer Main
MATH1005 **Statistics**	3	**A** HSC Mathematics **N** MATH1015, MATH1905, STAT1021, STAT1022, ECMT1010	Semester 2 Summer Main
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Second year			
INFO2110 **Systems Analysis and Modelling**	6	**A** Experience with a data model as in INFO1003 or INFO1103 or INFS1000 **N** INFO2810, INFO2000, INFO2900	Semester 2
INFO2120 **Database Systems 1**	6	**A** Some exposure to programming and some familiarity with data model concepts such as taught in INFO1103 or INFO1003 or INFS1000 or INFO1903 **N** INFO2820, INFO2005, INFO2905	Semester 1
INFO2315 **Introduction to IT Security**	6	**A** Computer literacy **N** NETS3305, NETS3605, NETS3016, NETS3916, ELEC5610, ELEC5616	Semester 2
MATH2069 **Discrete Mathematics and Graph Theory**	6	**P** 6 credit points of Junior level Mathematics **N** MATH2011, MATH2009, MATH2969	Semester 1
COMP2007 **Algorithms and Complexity**	6	**A** INFO1105, MATH1004 or MATH1904 **N** COMP2907, COMP3309, COMP3609, COMP3111, COMP3811	Semester 2
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1
Third year			
COMP3615 **Software Development Project**	6	**P** INFO3402 **N** INFO3600, SOFT3300, SOFT3600, SOFT3200, SOFT3700	Semester 2
ELEC3609 **Internet Software Platforms**	6	**P** INFO1103, INFO2110, INFO2120 **N** EBUS4001	Semester 2
INFO3220 **Object Oriented Design**	6	**A** INFO2110, INFO1105 **N** SOFT3301, SOFT3601, SOFT3101, SOFT3801, COMP3008, COMP3908	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
INFO3315 **Human-Computer Interaction**	6	**A** INFO2110 **N** MULT3307, MULT3607, MULT3018, MULT3918, SOFT3102, SOFT3802, COMP3102, COMP3802	Semester 2
INFO3402 **Management of IT Projects and Systems**	6	**A** INFO2000, INFO2110, INFO2810, INFO2900 **N** ISYS3000, ISYS3012, ELEC3606	Semester 1
Fourth year			
COMP5348 **Enterprise Scale Software Architecture**	6	**A** INFO3220 or COMP5028 or equivalent.	Semester 1
ELEC4702 **Practical Experience**		**P** 24 credit points of level 3 or 4 units of study.	Semester 1 Semester 2
ELEC5618 **Software Quality Engineering**	6	**N** SOFT3302	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
Students must select 12cp from the following block of units. Students enrol in either Honours Thesis A&B or Engineering Project A&B. For enrolment in Honours an ISWAM of 65% or greater is required.			
ELEC4710 **Engineering Project A**	6	**P** 36 credit points of units of study from level 3 and above. **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
ELEC4711 **Engineering Project B**	6	**A** 36 credit points of units of study from level 3 and above **P** ELEC4710 Engineering Project A **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4712 **Honours Thesis A**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4713 **N** ELEC4703, ELEC4705, ELEC4707 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC4713 **Honours Thesis B**	6	**P** 36 credit points of units of study from level 3 and above **C** ELEC4712 **N** ELEC4707, ELEC4711 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Notes 1. The Mathematics, Physics and Information Technology units of study may be replaced by equivalent advanced level units of study (if available) subject to prerequisite conditions being met. 2. Students in the Honours program must enrol in ELEC4712 & ELEC4713 or the alternate IT Research units INFO4991 & INFO4992, students in the Pass Program must enrol in ELEC4710 & ELEC4711.			
Additional Software Engineering recommended units of study			
ACCT1003 **Financial Accounting Concepts**	6	**N** ACCT1001, ACCT1002 *Terminating unit.*	Semester 1
ACCT1004 **Management Accounting Concepts**	6	**N** ACCT1001, ACCT1002 *Terminating unit.*	Semester 2
MKTG1001 **Marketing Principles**	6	**N** MKTG2001	Semester 1 Semester 2
MATH2061 **Linear Mathematics and Vector Calculus**	6	**P** MATH(1011 or 1001 or 1901 or 1906) and MATH(1014 or 1002 or 1902) and MATH(1003 or 1903 or 1907) **N** MATH2001, MATH2901, MATH2002, MATH2902, MATH2961, MATH2067	Semester 1 Summer Main
PHYS1001 **Physics 1 (Regular)**	6	**A** HSC Physics **C** Recommended concurrent Units of Study: MATH (1001/1901, 1002/1902) **N** PHYS1002, PHYS1901, EDUH1017	Semester 1
PHYS1003 **Physics 1 (Technological)**	6	**A** HSC Physics or PHYS (1001 or 1002 or 1901) or equivalent. **C** Recommended concurrent Units of Study: MATH (1003/1903), MATH (1005/1905). **N** PHYS1004, PHYS1902 *It is recommended that PHYS (1001 or 1002 or 1901) be completed before this unit*	Semester 2
PHYS2213 **Physics 2EE**	6	**A** MATH (1001/1901 and 1002/1902 and 1003/1903). MATH (1005/1905) would also be useful **P** PHYS (1001 or 1901) and PHYS (1003 or 1902) **N** PHYS2203, PHYS2001, PHYS2901, PHYS2011, PHYS2911, PHYS2002, PHYS2902, PHYS2012, PHYS2912	Semester 2

5.5 School of Information Technologies

The School of Information Technologies offers the following programs.

Degrees

The School of IT offers the following three degrees:

- The Bachelor of Computer Science and Technology (BCST). Its normal duration is three years (144 Credit Points).
- The BCST (Advanced). Its normal duration is three years (144 Credit Points).
- The Bachelor of Information Technology (BIT). Its normal duration is four years (192 Credit Points).

In addition, the school offers the following combined degrees:

- Bachelor of Information Technology and Bachelor of Arts (BIT/BA) (240 Credit Points).
- Bachelor of Information Technology and Bachelor of Commerce (BIT/BCom) (240 Credit Points).
- Bachelor of Information Technology and Bachelor of Law (BIT/LLB) (288 Credit Points).
- Bachelor of Information Technology and Bachelor of Medical Science (BIT/BMedSc) (240 Credit Points).
- Bachelor of Information Technology and Bachelor of Science (BIT/BSc) (240 Credit Points).

Streams

The School of IT offers these streams in the degrees listed above:

- Computer Science
- Information Systems

Students enrolled in BCST, BCST (Advanced) or BIT must complete at least one of the two offered streams.

Students enrolled in the BSc or BSc (Advanced) degrees offered by the Faculty of Science can select Computer Science and/or Information Systems as their major in their senior (third) year.

Honours

The School of IT offers three different honours degrees:

1. After completing the requirements for a BCST or a pass degree from the Faculty of Science or a degree equivalent to the BCST from another institution, students can apply for enrolment in the honours degree (normal duration 1 year), and upon successful completion they will be awarded a BCST(Honours).
2. After completing the requirements for a BCST(Adv) or a BSc(Adv) degree from the Faculty of Science or a degree equivalent to the BCST(Adv) from another institution, students can apply for enrolment in the honours degree (normal duration 1 year), and upon successful completion they will be awarded a BCST(Adv)(Honours).
3. In their fourth year (after completing 144 credit points) students enrolled in the BIT degree, can either pursue the coursework option or the honours option. A successful completion of the honours option will result in an award of a BIT (Honours) degree. In addition, students who have completed a pass degree of BSc, or equivalent, can apply for enrolment in the BSc(Hons) with honours in Computer Science or in Information Systems, as offered by the Faculty of Science.

Minors

The School of IT offers a *minor in IT*. A 'minor' is defined as at least 18 credit points from SIT coded units (COMP, INFO, ISYS), at the Intermediate level (second year) or above.

The school will issue a certificate to all students who have completed the requirements for a degree of the University of Sydney and who complete the requirements for an IT minor, upon application.

An application form is available at www.it.usyd.edu.au/minor.

Bachelor of Information Technology stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Candidates for the degree of Bachelor of Information Technology (BIT) are required to gain credit for 192 credit points from the units of study set out below. The selection of units must satisfy the degree rules in the Resolutions of the Faculty. In particular, all core units must be completed, along with an appropriate amount from the elective units of study as recommended by the Faculty. Candidates for the BIT degree must complete a stream in either Computer Science or Information Systems, or both, as described in the Tables below. Enrolment is subject to the following constraints: 1. At most 72 credit points accumulated from first year units (core and recommended electives) can be counted for degree completion. 2. At least 84 credit points must be accumulated from 3000-level and above units (including 72cp of core, selected core and recommended electives as outlined in this table). 3. Candidates in the BIT degree must maintain a credit average in each year of enrolment. If this level of result is not achieved candidates will be transferred to the BCST degree program. Through this table, candidates may substitute an advanced equivalent for a non- advanced unit mentioned. They may also substitute an appropriate unit from the Advanced Engineering program of the Faculty of Engineering, or the Talented Student Program of the Faculty of Science, if they are eligible to enrol in such units.			
(i) Stream in Computer Science			
First year core units of study for CS stream			
ENGG1805 **Professional Engineering and IT**	6		Semester 1
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
Note: INFO1903 Informatics (Adv) can be taken as an alternate core unit to INFO1103.			
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Note: INFO1905 (advanced version) can be taken as an alternate to INFO1105.			
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
First year recommended elective units of study for CS stream			
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
INFO1003 **Foundations of Information Technology**	6	**N** INFO1000 or INFS1000	Semester 1 Semester 2
INFO1903 **Informatics (Advanced)**	6	**A** HSC Mathematics **P** ATAR sufficient to enter BCST(Adv), BIT or BSc(Adv), or portfolio of work suitable for entry *Note: Department permission required for enrolment*	Semester 1
Second Year core units of study for CS stream			
COMP2007 **Algorithms and Complexity**	6	**A** INFO1105, MATH1004 or MATH1904 **N** COMP2907, COMP3309, COMP3609, COMP3111, COMP3811	Semester 2
Note: COMP2907 (advanced version) can be taken as an alternate to COMP2007.			
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1
INFO2110 **Systems Analysis and Modelling**	6	**A** Experience with a data model as in INFO1003 or INFO1103 or INFS1000 **N** INFO2810, INFO2000, INFO2900	Semester 2
INFO2120 **Database Systems 1**	6	**A** Some exposure to programming and some familiarity with data model concepts such as taught in INFO1103 or INFO1003 or INFS1000 or INFO1903 **N** INFO2820, INFO2005, INFO2905	Semester 1
Note: INFO2820 (advanced version) can be taken as an alternate core unit to INFO2120.			
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
Second year recommended elective units of study for CS stream			
INFO2315 **Introduction to IT Security**	6	**A** Computer literacy **N** NETS3305, NETS3605, NETS3016, NETS3916, ELEC5610, ELEC5616	Semester 2
ISYS2140 **Information Systems**	6	**A** INFO1003 or INFS1000 **N** ISYS2006. ISYS2007	Semester 1
All 2000-level ELEC units of study are recommended.			
Third year core units of study for CS stream Students are required to complete at least 36 credit points of 3000-level from the core, selected core and recommended electives units of study listed here for the CS stream.			
INFO3402 **Management of IT Projects and Systems**	6	**A** INFO2000, INFO2110, INFO2810, INFO2900 **N** ISYS3000, ISYS3012, ELEC3606	Semester 1
INFO3600 **Major Development Project (Advanced)**	12	**P** INFO3402 **N** COMP3615, ISYS3400, SOFT3300, SOFT3600, SOFT3200, SOFT3700 *Only available to students in BIT, BCST(Adv) or BSc(Adv)*	Semester 2
CS & IS double stream: Students enrolled in the double stream must also complete ISYS3401 Analytical Methods and Information Systems as a core unit of study from the CS stream.			
Third year selected core units of study for CS stream Students must complete at least 12 credit points from the following list.			
COMP3109 **Programming Languages and Paradigms**	6	**A** COMP2007	Semester 2
COMP3308 **Introduction to Artificial Intelligence**	6	**A** COMP2007 **N** COMP3608, COMP3002, COMP3902	Semester 1
COMP3608 **Intro. to Artificial Intelligence (Adv)**	6	**P** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **N** COMP3308, COMP3002, COMP3902	Semester 1
COMP3419 **Graphics and Multimedia**	6	**A** COMP2007, MATH1002 **N** MULT3306, MULT3606, MULT3019, MULT3919, MULT3004, MULT3904, COMP3004, COMP3904	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
COMP3456 **Computational Methods for Life Sciences**	6	**P** INFO1105 and (COMP2007 or INFO2120) and 6 credit points from BIOL or MBLG	Semester 2
COMP3520 **Operating Systems Internals**	6	**A** COMP2129, INFO1105 **N** NETS3304, NETS3604, NETS3009, NETS3909, COMP3009, COMP3909	Semester 1
ELEC3506 **Data Communications and the Internet**	6	**N** NETS2150, NETS2009, NETS2909, NETS3007, NETS3907, ELEC3504, ELEC4501	Semester 2
ELEC3609 **Internet Software Platforms**	6	**P** INFO1103, INFO2110, INFO2120 **N** EBUS4001	Semester 2
INFO3220 **Object Oriented Design**	6	**A** INFO2110, INFO1105 **N** SOFT3301, SOFT3601, SOFT3101, SOFT3801, COMP3008, COMP3908	Semester 1
INFO3315 **Human-Computer Interaction**	6	**A** INFO2110 **N** MULT3307, MULT3607, MULT3018, MULT3918, SOFT3102, SOFT3802, COMP3102, COMP3802	Semester 2
INFO3404 **Database Systems 2**	6	**A** Introductory database study such as INFO2120 or INFO2820 or INFO2005 or INFO2905. Students are expected to be familiar with SQL and the relational data model, and to have some programming experience. **N** INFO3504, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
INFO3504 **Database Systems 2 (Adv)**	6	**P** Distinction-level result in INFO2120 or INFO2820 or COMP2007 or COMP2907 **N** INFO3404, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
CS & IS double stream: Students must complete 24 credit points from the combination of selected core units for the CS stream and the IS stream, including at least 12 cp from the list above.			
Third year recommended elective units of study for CS stream			
ELEC3607 **Embedded Computing**	6	**A** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **P** ELEC1601 and ELEC2602 **N** ELEC2601	Semester 1
ELEC3610 **E-Business Analysis and Design**	6	**P** INFO2120 **N** EBUS3003, EBUS3001	Semester 1
ISYS3401 **Analytical Methods & Information Systems**	6	**A** INFO2110, ISYS2140 **N** ISYS3015	Semester 1
All 3000-level and above ELEC units of study are recommended.			
Fourth year selected core units of study for CS stream Students in the BIT Pass degree must complete at least 48 credit points from this list.			
COMP5045 **Computational Geometry**	6	**A** Data structures, analysis of algorithms **N** COMP4045	Semester 1
COMP5046 **Statistical Natural Language Processing**	6	**A** Concepts of Linguistics, elementary statistics, AI techniques. **N** COMP4046	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Networking concepts, operating system concepts, programming expertise. **N** NETS4047	Semester 2
COMP5048 **Information Visualisation**	6	**A** Discrete mathematics, algorithms and complexity. **N** COMP4048	Semester 2
COMP5318 **Knowledge Discovery and Data Mining**	6	**A** COMP5138 and familiarity with basic statistics *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
COMP5338 **Advanced Data Models**	6	**A** COMP5138 or equivalent	Semester 2
COMP5348 **Enterprise Scale Software Architecture**	6	**A** INFO3220 or COMP5028 or equivalent.	Semester 1
COMP5416 **Advanced Network Technologies**	6	**A** ELEC3506 or equivalent	Semester 2
COMP5424 **Information Technology in Biomedicine**	6	**A** Basic programming skills	Semester 1
COMP5425 **Multimedia Storage, Retrieval & Delivery**	6	**A** Algorithms (equivalent to COMP5211).	Semester 1
COMP5426 **Parallel and Distributed Computing**	6	**A** Equivalent of COMP5116	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. **N** ELEC5504, ELEC4504	Semester 2
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. **N** ELEC5501	Semester 1
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3607, ELEC3305, ELEC3506 and ELEC5508	Semester 2
ELEC5614 **Real Time Computing**	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). Ability to program in a high level language. **N** ELEC4602	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1
ELEC5618 **Software Quality Engineering**	6	**N** SOFT3302	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
INFO5991 **Services Science Management and Eng**	6	**A** INFO5990	Semester 1 Semester 2
INFO5992 **Understanding IT Innovations**	6	**A** INFO5990 **N** PMGT5875	Semester 1 Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** Information systems concepts, database concepts **N** ISYS4050 *Note: Department permission required for enrolment*	Semester 1
## (ii) Stream in Information Systems			
### First year core units of study for IS stream			
ENGG1805 **Professional Engineering and IT**	6		Semester 1
INFO1003 **Foundations of Information Technology**	6	**N** INFO1000 or INFS1000	Semester 1 Semester 2
Note: INFO1903 Informatics (Adv) can be taken as an alternate core unit to both INFO1103 and INFO1003.			
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
Note: INFO1903 Informatics (Adv) can be taken as an alternate core unit to both INFO1103 and INFO1003.			
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Note: INFO1905 (advanced version) can be taken as an alternate core unit to INFO1105.			
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
### First year recommended elective units of study for IS stream			
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
INFO1903 **Informatics (Advanced)**	6	**A** HSC Mathematics **P** ATAR sufficient to enter BCST(Adv), BIT or BSc(Adv), or portfolio of work suitable for entry *Note: Department permission required for enrolment*	Semester 1
### Second year core units of study for IS stream			
INFO2110 **Systems Analysis and Modelling**	6	**A** Experience with a data model as in INFO1003 or INFO1103 or INFS1000 **N** INFO2810, INFO2000, INFO2900	Semester 2
INFO2315 **Introduction to IT Security**	6	**A** Computer literacy **N** NETS3305, NETS3605, NETS3016, NETS3916, ELEC5610, ELEC5616	Semester 2
ISYS2140 **Information Systems**	6	**A** INFO1003 or INFS1000 **N** ISYS2006. ISYS2007	Semester 1
INFO2120 **Database Systems 1**	6	**A** Some exposure to programming and some familiarity with data model concepts such as taught in INFO1103 or INFO1003 or INFS1000 or INFO1903 **N** INFO2820, INFO2005, INFO2905	Semester 1
Note: INFO2820 (advanced version) can be taken as an alternate core unit to INFO2120.			
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
### Second year recommended elective units of study for IS stream			
COMP2007 **Algorithms and Complexity**	6	**A** INFO1105, MATH1004 or MATH1904 **N** COMP2907, COMP3309, COMP3609, COMP3111, COMP3811	Semester 2
COMP2907 **Algorithms and Complexity (Advanced)**	6	**A** INFO1905, MATH1904 **P** Distinction level result in INFO(1105 or INFO1905 or SOFT1002 or SOFT1902	Semester 2
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
All 2000-level ELEC units of study are recommended electives.			
Third year core units of study for IS stream			
Students are required to complete at least 36 credit points of 3000-level from the core, selected core and recommended electives units of study listed here for the IS stream.			
INFO3402 **Management of IT Projects and Systems**	6	**A** INFO2000, INFO2110, INFO2810, INFO2900 **N** ISYS3000, ISYS3012, ELEC3606	Semester 1
INFO3600 **Major Development Project (Advanced)**	12	**P** INFO3402 **N** COMP3615, ISYS3400, SOFT3300, SOFT3600, SOFT3200, SOFT3700 *Only available to students in BIT, BCST(Adv) or BSc(Adv)*	Semester 2
ISYS3401 **Analytical Methods & Information Systems**	6	**A** INFO2110, ISYS2140 **N** ISYS3015	Semester 1
Third year selected core units of study for IS stream			
Students must complete at least 6 credit points from the following list.			
ELEC3610 **E-Business Analysis and Design**	6	**P** INFO2120 **N** EBUS3003, EBUS3001	Semester 1
INFO3315 **Human-Computer Interaction**	6	**A** INFO2110 **N** MULT3307, MULT3607, MULT3018, MULT3918, SOFT3102, SOFT3802, COMP3102, COMP3802	Semester 2
INFO3404 **Database Systems 2**	6	**A** Introductory database study such as INFO2120 or INFO2820 or INFO2005 or INFO2905. Students are expected to be familiar with SQL and the relational data model, and to have some programming experience. **N** INFO3504, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
INFO3504 **Database Systems 2 (Adv)**	6	**P** Distinction-level result in INFO2120 or INFO2820 or COMP2007 or COMP2907 **N** INFO3404, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
CS & IS double stream: Students must complete 24 credit points from the combination of selected core units for the CS stream and the IS stream, including at least 6 cp from the list above.			
Third year recommended elective units of study for IS stream			
COMP3109 **Programming Languages and Paradigms**	6	**A** COMP2007	Semester 2
COMP3308 **Introduction to Artificial Intelligence**	6	**A** COMP2007 **N** COMP3608, COMP3002, COMP3902	Semester 1
COMP3608 **Intro. to Artificial Intelligence (Adv)**	6	**P** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **N** COMP3308, COMP3002, COMP3902	Semester 1
COMP3419 **Graphics and Multimedia**	6	**A** COMP2007, MATH1002 **N** MULT3306, MULT3606, MULT3019, MULT3919, MULT3004, MULT3904, COMP3004, COMP3904	Semester 1
COMP3456 **Computational Methods for Life Sciences**	6	**P** INFO1105 and (COMP2007 or INFO2120) and 6 credit points from BIOL or MBLG	Semester 2
COMP3520 **Operating Systems Internals**	6	**A** COMP2129, INFO1105 **N** NETS3304, NETS3604, NETS3009, NETS3909, COMP3009, COMP3909	Semester 1
ELEC3506 **Data Communications and the Internet**	6	**N** NETS2150, NETS2009, NETS2909, NETS3007, NETS3907, ELEC3504, ELEC4501	Semester 2
ELEC3607 **Embedded Computing**	6	**A** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **P** ELEC1601 and ELEC2602 **N** ELEC2601	Semester 1
ELEC3609 **Internet Software Platforms**	6	**P** INFO1103, INFO2110, INFO2120 **N** EBUS4001	Semester 2
INFO3220 **Object Oriented Design**	6	**A** INFO2110, INFO1105 **N** SOFT3301, SOFT3601, SOFT3101, SOFT3801, COMP3008, COMP3908	Semester 1
INFO3315 **Human-Computer Interaction**	6	**A** INFO2110 **N** MULT3307, MULT3607, MULT3018, MULT3918, SOFT3102, SOFT3802, COMP3102, COMP3802	Semester 2
All 3000-level and above ELEC units of study are recommended electives.			
Fourth year selected core units of study for IS stream Students in the BIT Pass degree must complete at least 48 credit points from this list.			
COMP5045 **Computational Geometry**	6	**A** Data structures, analysis of algorithms **N** COMP4045	Semester 1
COMP5046 **Statistical Natural Language Processing**	6	**A** Concepts of Linguistics, elementary statistics, AI techniques. **N** COMP4046	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Networking concepts, operating system concepts, programming expertise. **N** NETS4047	Semester 2
COMP5048 **Information Visualisation**	6	**A** Discrete mathematics, algorithms and complexity. **N** COMP4048	Semester 2
COMP5318 **Knowledge Discovery and Data Mining**	6	**A** COMP5138 and familiarity with basic statistics *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
COMP5338 **Advanced Data Models**	6	**A** COMP5138 or equivalent	Semester 2
COMP5348 **Enterprise Scale Software Architecture**	6	**A** INFO3220 or COMP5028 or equivalent.	Semester 1
COMP5416 **Advanced Network Technologies**	6	**A** ELEC3506 or equivalent	Semester 2
COMP5424 **Information Technology in Biomedicine**	6	**A** Basic programming skills	Semester 1
COMP5425 **Multimedia Storage, Retrieval & Delivery**	6	**A** Algorithms (equivalent to COMP5211).	Semester 1
COMP5426 **Parallel and Distributed Computing**	6	**A** Equivalent of COMP5116	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. **N** ELEC5504, ELEC4504	Semester 2
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. **N** ELEC5501	Semester 1
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3607, ELEC3305, ELEC3506 and ELEC5508	Semester 2
ELEC5614 **Real Time Computing**	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). Ability to program in a high level language. **N** ELEC4602	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1
ELEC5618 **Software Quality Engineering**	6	**N** SOFT3302	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
INFO5991 **Services Science Management and Eng**	6	**A** INFO5990	Semester 1 Semester 2
INFO5992 **Understanding IT Innovations**	6	**A** INFO5990 **N** PMGT5875	Semester 1 Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** Information systems concepts, database concepts **N** ISYS4050 *Note: Department permission required for enrolment*	Semester 1

Honours (CS and IS streams)

The BIT may be awarded as an Honours degree. Students may enrol in the Honours course after completion of 144 credit points, if they meet the specified entry conditions. Students enrolled in a BIT degree must apply for enrolment into the Honours program after completion of 144 credit points.

All students in BIT(Honours) must complete the following 24 credit points of core requirements plus 24 credit points from the fourth year selected core list of their respective stream. These units are only available to students enrolled in Honours degrees, those in Research Higher degrees, or those in the Research track in postgraduate coursework degrees. In addition to the core units students must also complete 24 credit points of elective units of study, please refer to the Fourth year selected core units listed in this table.

Honours core units of study

INFO4991 **IT Research Thesis A**	6	**P** Enrolment in Honours (BCST or BIT) **C** INFO4992 and INFO5993 *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO4992 **IT Research Thesis B**	12	**P** Enrolment in Honours (BCST or BIT) **C** INFO4991 and INFO5993 *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO4999 **Computer Science Honours Result**		**P** Permission of the Head of Department *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO5993 **IT Research Methods**	6	**A** Elementary statistics **N** INFO4990 *Note: Department permission required for enrolment*	Semester 1 Semester 2

Bachelor of Computer Science and Technology (BCST) stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Candidates for the degree Bachelor of Computer Science and Technology (BCST) are required to gain credit for 144 credit points from the units of study set out below. The selection of units must satisfy the degree rules in the Resolutions of the Faculty. In particular, all core units must be completed, along with an appropriate amount from the elective units of study as recommended by the Faculty. Candidates for the BCST degree must complete a stream in either Computer Science or Information Systems, or both, as described in the Tables below. Enrolment is subject to the following constraint: 1. At most 72 credit points accumulated from first year units (including core and recommended electives) can be counted for degree completion. Through this Table, candidates may substitute an advanced equivalent for a non- advanced unit mentioned. They may also substitute an appropriate unit from the Advanced Engineering program of the Faculty of Engineering, or the Talented Student Program of the Faculty of Science, if they are eligible to enrol in such units.			
(i) Stream in Computer Science			
First year core units of study for CS stream			
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
ENGG1805 **Professional Engineering and IT**	6		Semester 1
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
Note: INFO1903 Informatics (Adv) can be taken as an alternate core unit to INFO1103.			
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Note: INFO1905 (advanced version) can be taken as an alternate core unit to INFO1105.			
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as elective units. A full list of MATH and STAT units are available from Science Faculty handbook.			
First year recommended elective units of study for CS stream			
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
INFO1003 **Foundations of Information Technology**	6	**N** INFO1000 or INFS1000	Semester 1 Semester 2
INFO1903 **Informatics (Advanced)**	6	**A** HSC Mathematics **P** ATAR sufficient to enter BCST(Adv), BIT or BSc(Adv), or portfolio of work suitable for entry *Note: Department permission required for enrolment*	Semester 1
Second year core units of study for CS stream			
COMP2007 **Algorithms and Complexity**	6	**A** INFO1105, MATH1004 or MATH1904 **N** COMP2907, COMP3309, COMP3609, COMP3111, COMP3811	Semester 2
Note: COMP2907 (advanced version) can be taken as an alternate core unit to COMP2007.			
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1
INFO2110 **Systems Analysis and Modelling**	6	**A** Experience with a data model as in INFO1003 or INFO1103 or INFS1000 **N** INFO2810, INFO2000, INFO2900	Semester 2
INFO2120 **Database Systems 1**	6	**A** Some exposure to programming and some familiarity with data model concepts such as taught in INFO1103 or INFO1003 or INFS1000 or INFO1903 **N** INFO2820, INFO2005, INFO2905	Semester 1
Note: INFO2820 (advanced version) can be taken as an alternate core unit to INFO2120.			
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
Second year recommended elective units of study for CS stream			
INFO2315 **Introduction to IT Security**	6	**A** Computer literacy **N** NETS3305, NETS3605, NETS3016, NETS3916, ELEC5610, ELEC5616	Semester 2
ISYS2140 **Information Systems**	6	**A** INFO1003 or INFS1000 **N** ISYS2006. ISYS2007	Semester 1
All 2000-level ELEC units of study are recommended electives.			
Third year core units of study for CS stream			
Students are required to complete at least 36 credit points of 3000-level units of study from the core, selected core and and recommended elective units listed here for the CS stream.			

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
COMP3615 **Software Development Project**	6	**P** INFO3402 **N** INFO3600, SOFT3300, SOFT3600, SOFT3200, SOFT3700	Semester 2
INFO3402 **Management of IT Projects and Systems**	6	**A** INFO2000, INFO2110, INFO2810, INFO2900 **N** ISYS3000, ISYS3012, ELEC3606	Semester 1
CS & IS double stream: Students enrolled in the double stream must also complete ISYS3401 Analytical Methods and Information Systems as a core unit of study from the CS stream.			
Third year selected core units of study for CS stream			
Students must complete at least 12 credit points from the list below.			
COMP3109 **Programming Languages and Paradigms**	6	**A** COMP2007	Semester 2
COMP3308 **Introduction to Artificial Intelligence**	6	**A** COMP2007 **N** COMP3608, COMP3002, COMP3902	Semester 1
COMP3608 **Intro. to Artificial Intelligence (Adv)**	6	**P** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **N** COMP3308, COMP3002, COMP3902	Semester 1
COMP3419 **Graphics and Multimedia**	6	**A** COMP2007, MATH1002 **N** MULT3306, MULT3606, MULT3019, MULT3919, MULT3004, MULT3904, COMP3004, COMP3904	Semester 1
COMP3456 **Computational Methods for Life Sciences**	6	**P** INFO1105 and (COMP2007 or INFO2120) and 6 credit points from BIOL or MBLG	Semester 2
COMP3520 **Operating Systems Internals**	6	**A** COMP2129, INFO1105 **N** NETS3304, NETS3604, NETS3009, NETS3909, COMP3009, COMP3909	Semester 1
ELEC3506 **Data Communications and the Internet**	6	**N** NETS2150, NETS2009, NETS2909, NETS3007, NETS3907, ELEC3504, ELEC4501	Semester 2
ELEC3610 **E-Business Analysis and Design**	6	**P** INFO2120 **N** EBUS3003, EBUS3001	Semester 1
INFO3220 **Object Oriented Design**	6	**A** INFO2110, INFO1105 **N** SOFT3301, SOFT3601, SOFT3101, SOFT3801, COMP3008, COMP3908	Semester 1
INFO3315 **Human-Computer Interaction**	6	**A** INFO2110 **N** MULT3307, MULT3607, MULT3018, MULT3918, SOFT3102, SOFT3802, COMP3102, COMP3802	Semester 2
INFO3404 **Database Systems 2**	6	**A** Introductory database study such as INFO2120 or INFO2820 or INFO2005 or INFO2905. Students are expected to be familiar with SQL and the relational data model, and to have some programming experience. **N** INFO3504, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
INFO3504 **Database Systems 2 (Adv)**	6	**P** Distinction-level result in INFO2120 or INFO2820 or COMP2007 or COMP2907 **N** INFO3404, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
CS & IS double stream: Students must complete 24 credit points from the combination of selected core units for the CS stream and the IS stream, including at least 12 cp from the list above.			
Third year recommend elective units of study for CS stream			
ELEC3607 **Embedded Computing**	6	**A** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **P** ELEC1601 and ELEC2602 **N** ELEC2601	Semester 1
ELEC3609 **Internet Software Platforms**	6	**P** INFO1103, INFO2110, INFO2120 **N** EBUS4001	Semester 2
ISYS3400 **Information Systems Project**	6	**A** INFO2120 **P** (INFO3402 or ISYS3012) and (ISYS3401 or ISYS3015) **N** INFO3600, ISYS3207	Semester 2
ISYS3401 **Analytical Methods & Information Systems**	6	**A** INFO2110, ISYS2140 **N** ISYS3015	Semester 1
All 3000-level and above ELEC units of study are recommended electives.			
(ii) Stream in Information Systems			
First year core units of study for IS stream			
ENGG1805 **Professional Engineering and IT**	6		Semester 1
INFO1003 **Foundations of Information Technology**	6	**N** INFO1000 or INFS1000	Semester 1 Semester 2
Note: INFO1903 Informatics (Adv) can be taken as an alternate core unit to both INFO1103 or INFO1003.			
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
Note: INFO1903 Informatics (Adv) can be taken as an alternate core unit to both INFO1103 or INFO1003.			
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Note: INFO1905 (advanced version) can be taken as an alternate core unit to INFO1105.			

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
First year recommended elective units of study for IS stream			
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
INFO1903 **Informatics (Advanced)**	6	**A** HSC Mathematics **P** ATAR sufficient to enter BCST(Adv), BIT or BSc(Adv), or portfolio of work suitable for entry *Note: Department permission required for enrolment*	Semester 1
Second year core units of study for IS stream			
INFO2110 **Systems Analysis and Modelling**	6	**A** Experience with a data model as in INFO1003 or INFO1103 or INFS1000 **N** INFO2810, INFO2000, INFO2900	Semester 2
INFO2120 **Database Systems 1**	6	**A** Some exposure to programming and some familiarity with data model concepts such as taught in INFO1103 or INFO1003 or INFS1000 or INFO1903 **N** INFO2820, INFO2005, INFO2905	Semester 1
Note: INFO2820 (advanced version) can be taken as an alternate core unit to INFO2120.			
INFO2315 **Introduction to IT Security**	6	**A** Computer literacy **N** NETS3305, NETS3605, NETS3016, NETS3916, ELEC5610, ELEC5616	Semester 2
ISYS2140 **Information Systems**	6	**A** INFO1003 or INFS1000 **N** ISYS2006. ISYS2007	Semester 1
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
Second year recommended elective units for IS stream			
COMP2007 **Algorithms and Complexity**	6	**A** INFO1105, MATH1004 or MATH1904 **N** COMP2907, COMP3309, COMP3609, COMP3111, COMP3811	Semester 2
COMP2907 **Algorithms and Complexity (Advanced)**	6	**A** INFO1905, MATH1904 **P** Distinction level result in INFO(1105 or INFO1905 or SOFT1002 or SOFT1902	Semester 2
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1
All 2000-level ELEC units of study are recommended.			
Third year core units of study for IS stream			
Students are required to complete at least 36 credit points of 3000-level from the core, selected core and recommended elective units of study listed here for the IS stream.			
INFO3402 **Management of IT Projects and Systems**	6	**A** INFO2000, INFO2110, INFO2810, INFO2900 **N** ISYS3000, ISYS3012, ELEC3606	Semester 1
ISYS3400 **Information Systems Project**	6	**A** INFO2120 **P** (INFO3402 or ISYS3012) and (ISYS3401 or ISYS3015) **N** INFO3600, ISYS3207	Semester 2
ISYS3401 **Analytical Methods & Information Systems**	6	**A** INFO2110, ISYS2140 **N** ISYS3015	Semester 1
Third year selected core units of study for IS stream Students must complete at least 6 credit points from the following list.			
ELEC3610 **E-Business Analysis and Design**	6	**P** INFO2120 **N** EBUS3003, EBUS3001	Semester 1
INFO3315 **Human-Computer Interaction**	6	**A** INFO2110 **N** MULT3307, MULT3607, MULT3018, MULT3918, SOFT3102, SOFT3802, COMP3102, COMP3802	Semester 2
INFO3404 **Database Systems 2**	6	**A** Introductory database study such as INFO2120 or INFO2820 or INFO2005 or INFO2905. Students are expected to be familiar with SQL and the relational data model, and to have some programming experience. **N** INFO3504, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
INFO3504 **Database Systems 2 (Adv)**	6	**P** Distinction-level result in INFO2120 or INFO2820 or COMP2007 or COMP2907 **N** INFO3404, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
CS & IS double stream: Students must complete 24 credit points from the combination of selected core for the CS stream and the IS stream, including at least 6 cp from the list above.			
Third year recommended elective units of study for IS stream			
COMP3109 **Programming Languages and Paradigms**	6	**A** COMP2007	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
COMP3308 **Introduction to Artificial Intelligence**	6	**A** COMP2007 **N** COMP3608, COMP3002, COMP3902	Semester 1
COMP3608 **Intro. to Artificial Intelligence (Adv)**	6	**P** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **N** COMP3308, COMP3002, COMP3902	Semester 1
COMP3419 **Graphics and Multimedia**	6	**A** COMP2007, MATH1002 **N** MULT3306, MULT3606, MULT3019, MULT3919, MULT3004, MULT3904, COMP3004, COMP3904	Semester 1
COMP3456 **Computational Methods for Life Sciences**	6	**P** INFO1105 and (COMP2007 or INFO2120) and 6 credit points from BIOL or MBLG	Semester 2
COMP3520 **Operating Systems Internals**	6	**A** COMP2129, INFO1105 **N** NETS3304, NETS3604, NETS3009, NETS3909, COMP3009, COMP3909	Semester 1
COMP3615 **Software Development Project**	6	**P** INFO3402 **N** INFO3600, SOFT3300, SOFT3600, SOFT3200, SOFT3700	Semester 2
ELEC3506 **Data Communications and the Internet**	6	**N** NETS2150, NETS2009, NETS2909, NETS3007, NETS3907, ELEC3504, ELEC4501	Semester 2
ELEC3607 **Embedded Computing**	6	**A** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **P** ELEC1601 and ELEC2602 **N** ELEC2601	Semester 1
ELEC3609 **Internet Software Platforms**	6	**P** INFO1103, INFO2110, INFO2120 **N** EBUS4001	Semester 2
INFO3220 **Object Oriented Design**	6	**A** INFO2110, INFO1105 **N** SOFT3301, SOFT3601, SOFT3101, SOFT3801, COMP3008, COMP3908	Semester 1
All 3000-level and above ELEC units of study are recommended.			

Honours

Students who have qualified for the BCST degree may apply to enter the BCST(Honours) year. Note that unlike BIT(Honours) or BE(Honours), the Honours in BCST requires an additional 48 credit points of study.

All BCST(Honours) students must complete the following 24 credit points of core units of study. These units are only available to students enrolled in Honours degrees, those in Research Higher degrees, or those in the Research track in postgraduate coursework degrees. In addition to the core units students must also complete 24 credit points of elective units of study, please refer to units listed in the BIT table Fourth Year Selected Core.

Fourth year Honours core units of study

INFO4991 **IT Research Thesis A**	6	**P** Enrolment in Honours (BCST or BIT) **C** INFO4992 and INFO5993 *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO4992 **IT Research Thesis B**	12	**P** Enrolment in Honours (BCST or BIT) **C** INFO4991 and INFO5993 *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO4999 **Computer Science Honours Result**		**P** Permission of the Head of Department *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO5993 **IT Research Methods**	6	**A** Elementary statistics **N** INFO4990 *Note: Department permission required for enrolment*	Semester 1 Semester 2

Bachelor of Computer Science and Technology (Advanced) stream requirements

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Candidates for the degree of Bachelor of Computer Science and Technology (Advanced) (BCST(Adv)) are required to gain 144 credit points from the units of study set out below. The selection of units must satisfy the degree rules in the Resolutions of the Faculty. In particular, all core units must be completed, along with appropriate amount of elective units of study as recommended by the Faculty. Candidates for the BSCT(Adv) degree must complete a stream in either Computer Science or Information Systems, or both, as described in the Tables below. Candidates in the BCST(Adv) degree must maintain a credit average in each year of enrolment. If this level of result is not achieved candidates will be transferred to the BCST degree program. Candidates in the BCST(Adv) degree must complete at least 12 credit points of 2000-level core and recommended units, and at least 12 credit points of 3000-level core and recommended units at advanced level. Enrolment is subject to the following constraint: 1. At most 72 credit points accumulated from first year units (including core and recommended electives) can be counted for degree completion. Candidates may substitute an appropriate unit from an Advanced Engineering program of the Faculty of Engineering and IT, or the Talented Student Program of the Faculty of Science, if they are eligible to enrol in such units.			
(i) Stream in Computer Science			
First year core units of study for CS stream			
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
ENGG1805 **Professional Engineering and IT**	6		Semester 1
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
Note: INFO1903 Informatics (Adv) can be taken as an alternate core unit to INFO1103.			
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Note: INFO1905 (advanced version) can be taken as an alternate core unit to INFO1105.			
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
First year recommended elective units of study for CS stream.			
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
INFO1003 **Foundations of Information Technology**	6	**N** INFO1000 or INFS1000	Semester 1 Semester 2
INFO1903 **Informatics (Advanced)**	6	**A** HSC Mathematics **P** ATAR sufficient to enter BCST(Adv), BIT or BSc(Adv), or portfolio of work suitable for entry *Note: Department permission required for enrolment*	Semester 1
Second year core units of study for CS stream			
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1
COMP2907 **Algorithms and Complexity (Advanced)**	6	**A** INFO1905, MATH1904 **P** Distinction level result in INFO(1105 or INFO1905 or SOFT1002 or SOFT1902	Semester 2
INFO2110 **Systems Analysis and Modelling**	6	**A** Experience with a data model as in INFO1003 or INFO1103 or INFS1000 **N** INFO2810, INFO2000, INFO2900	Semester 2
INFO2820 **Database Systems 1 (Advanced)**	6	**P** Distinction-level result in INFO1003 or INFO1103 or INFO1903 or INFO1105 or INFO1905 **N** INFO2120, INFO2005, INFO2905	Semester 1
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
Second year recommended elective units of study for CS stream			
INFO2315 **Introduction to IT Security**	6	**A** Computer literacy **N** NETS3305, NETS3605, NETS3016, NETS3916, ELEC5610, ELEC5616	Semester 2
ISYS2140 **Information Systems**	6	**A** INFO1003 or INFS1000 **N** ISYS2006. ISYS2007	Semester 1
All 2000-level ELEC units of study are recommended.			
Third year core units of study for CS stream Students are required to complete at least 36 credit points of 3000-level from the core, selected core and recommended elective units of study listed here for the CS stream.			

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
INFO3402 **Management of IT Projects and Systems**	6	**A** INFO2000, INFO2110, INFO2810, INFO2900 **N** ISYS3000, ISYS3012, ELEC3606	Semester 1
INFO3600 **Major Development Project (Advanced)**	12	**P** INFO3402 **N** COMP3615, ISYS3400, SOFT3300, SOFT3600, SOFT3200, SOFT3700 *Only available to students in BIT, BCST(Adv) or BSc(Adv)*	Semester 2
CS & IS double stream: Students enrolled in the double stream must also complete ISYS3401 Analytical Methods and Information Systems as a core unit of study from the CS stream.			
Third year selected core units of study for CS stream Students must complete at least 12 credit points from the list below.			
COMP3109 **Programming Languages and Paradigms**	6	**A** COMP2007	Semester 2
COMP3308 **Introduction to Artificial Intelligence**	6	**A** COMP2007 **N** COMP3608, COMP3002, COMP3902	Semester 1
COMP3608 **Intro. to Artificial Intelligence (Adv)**	6	**P** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **N** COMP3308, COMP3002, COMP3902	Semester 1
COMP3419 **Graphics and Multimedia**	6	**A** COMP2007, MATH1002 **N** MULT3306, MULT3606, MULT3019, MULT3919, MULT3004, MULT3904, COMP3004, COMP3904	Semester 1
COMP3456 **Computational Methods for Life Sciences**	6	**P** INFO1105 and (COMP2007 or INFO2120) and 6 credit points from BIOL or MBLG	Semester 2
COMP3520 **Operating Systems Internals**	6	**A** COMP2129, INFO1105 **N** NETS3304, NETS3604, NETS3009, NETS3909, COMP3009, COMP3909	Semester 1
ELEC3506 **Data Communications and the Internet**	6	**N** NETS2150, NETS2009, NETS2909, NETS3007, NETS3907, ELEC3504, ELEC4501	Semester 2
ELEC3609 **Internet Software Platforms**	6	**P** INFO1103, INFO2110, INFO2120 **N** EBUS4001	Semester 2
INFO3220 **Object Oriented Design**	6	**A** INFO2110, INFO1105 **N** SOFT3301, SOFT3601, SOFT3101, SOFT3801, COMP3008, COMP3908	Semester 1
INFO3315 **Human-Computer Interaction**	6	**A** INFO2110 **N** MULT3307, MULT3607, MULT3018, MULT3918, SOFT3102, SOFT3802, COMP3102, COMP3802	Semester 2
INFO3404 **Database Systems 2**	6	**A** Introductory database study such as INFO2120 or INFO2820 or INFO2005 or INFO2905. Students are expected to be familiar with SQL and the relational data model, and to have some programming experience. **N** INFO3504, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
INFO3504 **Database Systems 2 (Adv)**	6	**P** Distinction-level result in INFO2120 or INFO2820 or COMP2007 or COMP2907 **N** INFO3404, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
CS & IS double stream: Students must complete 24 credit points from the combination of selected core units for the CS stream and the IS stream, including at least 12 cp from the list above.			
Third year recommended elective units of study for CS stream			
ELEC3607 **Embedded Computing**	6	**A** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **P** ELEC1601 and ELEC2602 **N** ELEC2601	Semester 1
ELEC3610 **E-Business Analysis and Design**	6	**P** INFO2120 **N** EBUS3003, EBUS3001	Semester 1
ISYS3401 **Analytical Methods & Information Systems**	6	**A** INFO2110, ISYS2140 **N** ISYS3015	Semester 1
All 3000-level and above ELEC units of study are recommended elective units.			
Also, appropriate fourth year units of study from BIT table can be taken as recommended electives with permission of the Head of School.			
(ii) Stream in Information Systems			
First year core units of study for IS stream			
ENGG1805 **Professional Engineering and IT**	6		Semester 1
INFO1003 **Foundations of Information Technology**	6	**N** INFO1000 or INFS1000	Semester 1 Semester 2
Note: INFO1903 Informatics (Adv) can be taken as an alternate core unit to both INFO1103 and INFO 1003.			
INFO1103 **Introduction to Programming**	6	**A** HSC Mathematics **N** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011	Semester 1 Semester 2
Note: INFO1903 Informatics (Adv) can be taken as an alternate core unit to both INFO1103 and INFO 1003.			
INFO1105 **Data Structures**	6	**A** Programming, as for INFO1103 **N** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902)	Semester 2
Note: INFO1905 (advanced version) can be taken as an alternate core unit to INFO1905.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
First year recommended elective units of study for IS stream			
ELEC1103 **Fundamentals of Elec and Electronic Eng**	6	**A** HSC Physics, HSC Mathematics extension 1 or 2	Semester 1
ELEC1601 **Foundations of Computer Systems**	6	**A** HSC Mathematics extension 1 or 2	Semester 2
INFO1903 **Informatics (Advanced)**	6	**A** HSC Mathematics **P** ATAR sufficient to enter BCST(Adv), BIT or BSc(Adv), or portfolio of work suitable for entry *Note: Department permission required for enrolment*	Semester 1
Second year core units of study for IS stream			
COMP2907 **Algorithms and Complexity (Advanced)**	6	**A** INFO1905, MATH1904 **P** Distinction level result in INFO(1105 or INFO1905 or SOFT1002 or SOFT1902	Semester 2
INFO2110 **Systems Analysis and Modelling**	6	**A** Experience with a data model as in INFO1003 or INFO1103 or INFS1000 **N** INFO2810, INFO2000, INFO2900	Semester 2
INFO2315 **Introduction to IT Security**	6	**A** Computer literacy **N** NETS3305, NETS3605, NETS3016, NETS3916, ELEC5610, ELEC5616	Semester 2
INFO2820 **Database Systems 1 (Advanced)**	6	**P** Distinction-level result in INFO1003 or INFO1103 or INFO1903 or INFO1105 or INFO1905 **N** INFO2120, INFO2005, INFO2905	Semester 1
ISYS2140 **Information Systems**	6	**A** INFO1003 or INFS1000 **N** ISYS2006. ISYS2007	Semester 1
Maths/Statistics requirement: A total of 18 credit points (with at least 6 credit points of 2000-level or above) of MATH and/or STAT units of are required for completion of this degree All 1000-level and 2000-level units offered in the Science subject areas of Mathematics and Statistics can be taken to meet this requirement, however the School recommends students choose from the following units; MATH1001, MATH1002, MATH1003, MATH1004, MATH1005, MATH2069, MATH2063 and STAT2012. MATH and STAT units that are not taken as core units can be taken as other units. A full list of MATH and STAT units are available from Science Faculty handbook.			
Second year recommended elective units of study for IS stream			
COMP2129 **Operating Systems and Machine Principles**	6	**A** Programming, as from INFO1103 **N** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904	Semester 1
All 2000-level ELEC units of study are recommended elective units.			
Third year core units of study for IS stream Students are required to complete at least 36 credit points of 3000-level from the core, selected core and recommended elective units of study listed here for the IS stream.			
INFO3402 **Management of IT Projects and Systems**	6	**A** INFO2000, INFO2110, INFO2810, INFO2900 **N** ISYS3000, ISYS3012, ELEC3606	Semester 1
INFO3600 **Major Development Project (Advanced)**	12	**P** INFO3402 **N** COMP3615, ISYS3400, SOFT3300, SOFT3600, SOFT3200, SOFT3700 *Only available to students in BIT, BCST(Adv) or BSc(Adv)*	Semester 2
ISYS3401 **Analytical Methods & Information Systems**	6	**A** INFO2110, ISYS2140 **N** ISYS3015	Semester 1
Third year selected core units of study for IS stream Students must complete at least 6 credit points from the following list.			
ELEC3610 **E-Business Analysis and Design**	6	**P** INFO2120 **N** EBUS3003, EBUS3001	Semester 1
INFO3315 **Human-Computer Interaction**	6	**A** INFO2110 **N** MULT3307, MULT3607, MULT3018, MULT3918, SOFT3102, SOFT3802, COMP3102, COMP3802	Semester 2
INFO3404 **Database Systems 2**	6	**A** Introductory database study such as INFO2120 or INFO2820 or INFO2005 or INFO2905. Students are expected to be familiar with SQL and the relational data model, and to have some programming experience. **N** INFO3504, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
INFO3504 **Database Systems 2 (Adv)**	6	**P** Distinction-level result in INFO2120 or INFO2820 or COMP2007 or COMP2907 **N** INFO3404, INFO3005, INFO3905, COMP3005, COMP3905	Semester 2
CS & IS double stream: Students must complete 24 credit points from the combination of selected core units for the CS stream and the IS stream, including at least 6 cp from the list above.			
Third year recommended elective units of study for IS stream			
COMP3109 **Programming Languages and Paradigms**	6	**A** COMP2007	Semester 2
COMP3308 **Introduction to Artificial Intelligence**	6	**A** COMP2007 **N** COMP3608, COMP3002, COMP3902	Semester 1
COMP3608 **Intro. to Artificial Intelligence (Adv)**	6	**P** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **N** COMP3308, COMP3002, COMP3902	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
COMP3419 **Graphics and Multimedia**	6	**A** COMP2007, MATH1002 **N** MULT3306, MULT3606, MULT3019, MULT3919, MULT3004, MULT3904, COMP3004, COMP3904	Semester 1
COMP3456 **Computational Methods for Life Sciences**	6	**P** INFO1105 and (COMP2007 or INFO2120) and 6 credit points from BIOL or MBLG	Semester 2
COMP3520 **Operating Systems Internals**	6	**A** COMP2129, INFO1105 **N** NETS3304, NETS3604, NETS3009, NETS3909, COMP3009, COMP3909	Semester 1
ELEC3506 **Data Communications and the Internet**	6	**N** NETS2150, NETS2009, NETS2909, NETS3007, NETS3907, ELEC3504, ELEC4501	Semester 2
ELEC3607 **Embedded Computing**	6	**A** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **P** ELEC1601 and ELEC2602 **N** ELEC2601	Semester 1
ELEC3609 **Internet Software Platforms**	6	**P** INFO1103, INFO2110, INFO2120 **N** EBUS4001	Semester 2
INFO3220 **Object Oriented Design**	6	**A** INFO2110, INFO1105 **N** SOFT3301, SOFT3601, SOFT3101, SOFT3801, COMP3008, COMP3908	Semester 1
All 3000-level and above ELEC units of study are recommended electives.			
Also, appropriate fourth year units of study from BIT table can be taken as recommended electives with permission of the Head of School.			

Honours

Students who have qualified for the BCST(Adv) degree may apply to enter the BCST(Adv)(Honours) year. Note that unlike BIT(Honours) or BE(Honours), the Honours in BCST(Adv) requires an additional 48 credit points of study.

All BCST(Adv)(Honours) students must complete the following 24 credit points of core units of study. These units are only available to students enrolled in Honours degrees, those in Research Higher degrees, or those in the Research track in postgraduate coursework degrees. In addition to the core units students must also complete 24 credit points of elective units of study, please refer to units listed in the BIT table Fourth Year Selected Core.

Fourth year Honours core units of study

INFO4991 **IT Research Thesis A**	6	**P** Enrolment in Honours (BCST or BIT) **C** INFO4992 and INFO5993 *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO4992 **IT Research Thesis B**	12	**P** Enrolment in Honours (BCST or BIT) **C** INFO4991 and INFO5993 *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO4999 **Computer Science Honours Result**		**P** Permission of the Head of Department *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO5993 **IT Research Methods**	6	**A** Elementary statistics **N** INFO4990 *Note: Department permission required for enrolment*	Semester 1 Semester 2

5.6 Advanced Engineering, IT talented student program and faculty-wide electives

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Advanced Engineering, Talented IT student program and Faculty-wide elective subjects			
Engineering students are eligible for the award of Advanced Engineering by completing a minimum of 18 cp of advanced units as listed in the following table. Only one Advanced unit can be selected from a particular year. Entry to the Advanced Engineering program is by invitation of the Dean and is based on a ATAR of 98+ in the NSW HSC or equivalent, or by obtaining a Distinction average in Years 1, 2 and 3 of their engineering course. Information technology degree students are eligible to join the talented IT student program by invitation of the Dean. Entry is based on a ATAR of 98+ in the NSW HSC or equivalent, or by obtaining a Distinction average in Years 1, 2 or 3 of their information technologies course.			
Advanced Engineering units			
ENGG1061 **Advanced Engineering 1A**	6	**P** ATAR score of at least 98 and good performance in HSC Maths, Physics and Chemistry. *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG2062 **Engineering Project: Business Plan 2 Adv**	6	**P** WAM of 75% or greater for 1st year studies. *Note: Department permission required for enrolment*	Semester 1
AERO2711 **Space Engineering Project 1**	6	**P** Completed the junior year of Aero(Space), Mechanical(Space) or Mechatronics(Space) Engineering. An average mark of > 75% is required as well as departmental permission from the Space Engineering Coordinator. *Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Main Winter Main
ENGG3062 **Technology Education (Advanced)**	6	**P** WAM of 75% or greater in 2nd year of studies. *Note: Department permission required for enrolment*	Semester 2
AERO3711 **Space Engineering Project 2**	6	**P** AERO2711 Space Engineering Project 1; a WAM of > 75% is required as well as departmental permission from the Space Engineering Coordinator. *Note: Department permission required for enrolment*	Semester 1 Semester 2
AERO4711 **Space Engineering Project 3**	6	**P** AERO3711 Space Engineering Project 2; a WAM of > 75% is required as well as departmental permission from the Space Engineering Coordinator. *Note: Department permission required for enrolment*	Semester 1 Semester 2
AERO4712 **Space Engineering Project 4**	6	**P** AERO4711 Space Engineering Project 3; a WAM of > 75% is required as well as departmental permission from the Space Engineering Coordinator. *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG4064 **Advanced Engineering Design A**	6	**P** WAM of 75% or greater in Senior Year of Studies. *Note: Department permission required for enrolment*	Semester 2
ENGG4065 **Advanced Engineering Design B**	6	**P** This unit is an extension module for students in ENGG4064. WAM of 75% or greater in Senior Year of Studies. *Note: Department permission required for enrolment*	Semester 2
Talented IT Students program units of study			
INFO1911 **IT Special Project 1A**	6	*Note: Department permission required for enrolment* *Enrolment in this unit of study is by invitation only.*	Semester 1
INFO1912 **IT Special Project 1B**	6	**A** ATAR of at least 98 and High Distinction average in first year IT units of study and Distinction average in first year non-IT units of study. *Note: Department permission required for enrolment* *Departmental permission is required.*	Semester 2
INFO2911 **IT Special Project 2A**	6	**P** Distinction average in non-IT units completed in previous year of study, high distinction average in IT units completed in previous year. *Note: Department permission required for enrolment* *Departmental permission required.*	Semester 1
INFO2912 **IT Special Project 2B**	6	**P** Distinction average in non-IT units completed in previous year of study, high distinction average in IT units completed in previous year. *Note: Department permission required for enrolment* *Departmental permission required.*	Semester 2
INFO3911 **IT Special Project 3A**	6	**P** Distinction average in non-IT units completed in previous year of study, high distinction average in IT units completed in previous year. *Note: Department permission required for enrolment* *Departmental permission required.*	Semester 1
INFO3912 **IT Special Project 3B**	6	**P** Distinction average in non-IT units completed in previous year of study, high distinction average in IT units completed in previous year. *Note: Department permission required for enrolment* *Departmental permission required.*	Semester 2
Faculty-wide units of study			
These units of study are available as core, alternate or elective units of study as the case may be in any discipline of Engineering or Information Technology.			
ENGG1800 **Engineering Disciplines (Intro) Stream A**	6		Semester 1
ENGG1801 **Engineering Computing**	6	**N** INFO1000, COSC1001, COSC1002, INFO1003	Semester 1
ENGG1802 **Engineering Mechanics**	6		Semester 2 Summer Main

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ENGG1803 Professional Engineering 1	6		Semester 1 Semester 2
ENGG1805 Professional Engineering and IT	6		Semester 1
ENGG2004 Engineering Studies B	4	*Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Main
ENGG2005 Engineering Studies C	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Main
ENGG2008 Engineering Studies A	2	*Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG3005 Engineering & Industrial Management Fund	6	*Note: Department permission required for enrolment*	Semester 2

6. Undergraduate units of study

Engineering and Information Technologies undergraduate units of study

Complete unit of study descriptions giving details of assessment, learning outcomes, graduate attribute mappings and semester schedule are published on the Faculty of Engineering and Information Technologies course information web site : http://cusp.sydney.edu.au/engineering/

School of Aerospace, Mechanical and Mechatronic Engineering

AERO1400
Intro to Aircraft Construction & Design

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours of workshop sessions per week **Assumed knowledge:** Some basic skills with engineering workshop hand tools is desireable **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The study towards BE(Aeronautical) involves learning about the Design, Analysis, Flight, and Operation of Aircraft and other Flight Platforms. This unit facilitates the training towards becoming professional aeronautical engineers through a globally-unique experiential-learning opportunity to provide a strong background familiarity with aircraft hardware. This unit is designed to educate and facilitate the learning of aircraft design, basic aircraft construction techniques, the operation of light aircraft and the registration and regulations relating to light aircraft. In addition to hands-on skills on the construction phase, this unit facilitates learning in motivations for unique aircraft design, aircraft aerodynamics, flight mechanics, structural aspects and other design-related issues. Teamwork plays a very important role in this unit; the ability to work with peers and supervising staff is an invaluable skill sought after by employers of engineers. Throughout the semester, students will be actively participating in the construction of a light aircraft. The aircraft is to be constructed under current Australian Civil Aviation Regulations so that students will gain an insight into all aspects of the process. By being a part of the construction team, students will also experience the organisational requirements necessary to successfully complete a complex engineering project. The aircraft construction workshop component is complemented with lectures, homework, research and assignments to further enhance the learning experience on aircraft. The final outcome will be that students gain a good foundation of: aircraft design and analyses methods; innovative methods of construction; techniques for selecting, sizing and stressing components; regulatory requirements for certification; off-design requirements; construction tolerances; and team-work requirements in undertaking complex engineering projects.

AERO1560
Introduction to Aerospace Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures, 2 hours of tutorials and 3 hours of workshop practice per week **Prohibitions:** MECH1560, MTRX1701, ENGG1800 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This Unit introduces students to the role of professional aerospace engineers, along with the development of fundamental engineering knowledge and skills for aerospace vehicle design, analysis performance and operation. Students will learn through experience, to develop professional skills in research, interpretation, communication, and presentation of information relating to aerospace engineering. Expected learning includes: introduction to lateral thinking concepts; glossary of aerospace vehicle components and terminology; an introduction to the multiple disciplines related to aerospace engineering, such as aerodynamics, aircraft and spacecraft performance, mechanics of flight, aerospace structures, materials and propulsion systems; how the various disciplines are integrated into the design and development of flight platform systems; the operating characteristics of modern flight vehicles, their uses and limitations; modern developments and future trends in aerospace; the limitations of the aerospace environment; teamwork; and resource management. Significantly, professional enhancement is introduced through the development of basic hands-on workshop skills. These practical skills enable students to have a better appreciation of the hardware that they are expected to apply their engineering knowledge to, during their aerospace engineering profession. Experiential learning is facilitated working with machine tools and hand tools in a supervised workshop environment, to develop fundamentals of practical aerospace vehicle component manufacture, construction, servicing and repair.

AERO2703
Aerospace Technology 1

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** AERO1560 **Assumed knowledge:** ENGG1801 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop in students an understanding of the background technologies and processes that are involved in the design, construction and operation of Aerospace vehicles. It will cover the general areas of aircraft performance, aircraft and laboratory instrumentation and associated programming techniques.

AERO2705
Space Engineering 1

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Prerequisites:** AERO1560 (or MECH1560 or MTRX1701), MATH1001, MATH1002, MATH1003) **Assumed knowledge:** ENGG1801 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to introduce students to the terminology, technology and current practice in the field of Space Engineering. Course content will include a variety of topics in the area of orbital mechanics, satellite systems and launch requirements. Case studies of current systems will be the focus of this unit.

AERO2711
Space Engineering Project 1

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Main, Winter Main **Classes:** 2 hours of project meeting per week. **Prerequisites:** Completed the junior year of Aero(Space), Mechanical(Space) or Mechatronics(Space) Engineering. An average mark of > 75% is required as well as departmental permission from the Space Engineering Coordinator. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit of study aims to develop deeper practical knowledge in the area of Space systems engineering. Students who take this subject would be interested in developing design skills by working on the sub-system of a real satellite or launch vehicle.

AERO3260
Aerodynamics 1

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. 5 hours of laboratory sessions per semester. **Prerequisites:** AMME2200 and (MATH2061 or MATH2067) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS should prepare students to be able to undertake aerodynamic performance calculations for industry design situations. The unit aims to develop a knowledge and appreciation of the complex behaviour of airflow in the case of two dimensional aerofoil sections and three dimensional wings; To encourage hands-on experimentation with wind-tunnel tests to allow an understanding of these concepts and their range of applicability. To understand the limitations of linearised theory and the effects of unsteady flow.

AERO3261
Propulsion

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Prerequisites:** AMME2200 **Assumed knowledge:** Good knowledge of fluid dynamics including gas dynamics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS teaches the students the techniques used to propel aircraft and rockets. The students will learn to analyse various propulsion systems in use propellers, gas turbines, rocket motors etc. The topics covered include: Propulsion unit requirements for subsonic and supersonic flight; thrust components, efficiencies, additive drag of intakes. Piston engine components and operation. Propeller theory. Operation, components and cycle analysis of gas turbine engines; turbojets; turbofans; turboprops; ramjets. Components: compressor; fan; burner; turbine; nozzle. Efficiency of components; off-design considerations. Operation, components and thermodynamics of rocket motors. Dynamics of rocket flight; orbital velocity; staging. Future directions; minimisation of noise and pollution; sub-orbital propulsion systems; scram-jets; hybrid engines.

AERO3360
Aerospace Structures 1

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Prerequisites:** AMME2301 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop a student's understanding of the theoretical basis of advanced aerospace structural analysis; and introduce students to the solution of real-world aircraft structural problems. This UoS will develop the following attributes: An understanding of the derivation of the fundamental equations of elasticity and their application in certain analytical problems; An understanding of plate theory and the ability to use this to obtain analytical solutions for plate bending and buckling problems; An understanding of energy-method to develop a deeper appreciation for the complexities of designing solution techniques for structural problems; An understanding of the basic principals behind stressed-skin aircraft construction and the practical analysis of typical aircraft components, including the limitations of such techniques. At the end of this unit students will have an understanding of: 2-D and 3-D elasticity: general equations and solution techniques; Energy methods in structural analysis, including the principles of virtual work and total potential and complimentary energies; Fundamental theory of plates, including in-plane and bending loads as well as buckling and shear instabilities; Solution techniques for plate problems including: Navier solutions for rectangular plates; Combined bending and in-plane loading problems; Energy methods for plate-bending; and Plate buckling for compression and shear loadings; Bending of beams with unsymmetrical cross-sections; Basic principals and theory of stressed-skin structural analysis; Determination of direct stresses and shear flows in arbitrary thin-walled beams under arbitrary loading conditions including: Unsymmetrical sections, Open and closed sections, Single and multi-cell closed sections, Tapered sections, Continuous and idealized sections; The analysis of common aircraft components including fuselages, wings, skin-panels, stringers, ribs, frames and cut-outs; The effects of end constraints and shear-lag on the solutions developed as well as an overall appreciation of the limitations of the solution methods presented

AERO3460
Aerospace Design 1

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of in-class project work per week. **Prerequisites:** AMME2301 and MECH2400 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to introduce students to the theory and practice of aircraft structural component design. In doing so it will emphasize all the considerations, trade-offs and decisions inherent in this process and thus enable students to gain an understanding of why aircraft structures are designed in the way they are with respect to structural, manufacturing and cost considerations. At the end of this unit students will be able to understand the design process, especially as it applies to aircraft structural component design; Have a familiarity with some of the practice of aircraft component structural design; An increasing familiarity with typical aircraft structural paradigms and how they work and can be analysed along with the primary failure modes that need to be considered; An understanding of the importance of different failure modes for different components and how these relate to load-conditions and understanding of some off the legal and ethical requirements of aircraft design engineers; A basic understanding of the regulatory framework in which aircraft design is conducted.

AERO3465
Aerospace Technology 2

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lecture/project work session per week. 2 hours of tutorials per week. **Prerequisites:** AMME2301 and MECH2400 **Assumed knowledge:** AERO1400; AMME2302 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of the aerospace industry procedures for design, analysis, and testing of aircraft and aerospace vehicle components. It provides a Design-Build-Test experience by putting into practice, learning outcomes from this and other previously completed UoS, through working on a small structure which is representative of a typical light metal aircraft. Students will be introduced to typical metallic and composite materials and structures for aerospace vehicles. The unit also provides an introduction to fatigue and damaged tolerance analysis of metallic aircraft structures. Experiential learning opportunities are provided to acquire skills and knowledge in structural design, analyses, testing methods, procedures, techniques, and equipment. On satisfactory completion of this unit students will have gained practical skills relevant to working on typical modern aircraft and aerospace vehicle components. They will learn from methods, techniques, and experiences from the modern aerospace industry. Experiential learning is enhanced through verifying analyses with actual testing of fabricated component, and the experience of a full design-build-test cycle of a typical aerospace structural component. Subject areas covered will include design methods, internal loads calculations, stress analysis, design for manufacture, joints and fasteners, test procedures, fatigue and damage tolerance, composites, and the art of design.

AERO3560
Flight Mechanics 1

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. 2 hours of laboratory work per semester. **Prerequisites:** AMME2500 and (MATH2061 or MATH2067) **Corequisites:** AMME3500 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of aircraft longitudinal equilibrium, static stability, dynamic stability and response. Students will develop an understanding of the importance and significance of flight stability, will gain skills in dynamic system analysis and will learn mathematical tools used for prediction of aircraft flight behaviour. Students will gain skills in problem solving in the area of flight vehicle motion, and learn the fundamentals of flight simulation. At the end of this unit students will be able to understand: aircraft flight conditions and equilibrium; the effects of aerodynamic and propulsive controls on equilibrium conditions; the significance of flight stability and its impact of aircraft operations and pilot workload; the meaning of aerodynamic stability derivatives and their sources; the effects of aerodynamic derivatives on flight stability; the impact of flight stability and trim on all atmospheric flight vehicles. Students will also be able to model aircraft flight characteristics using computational techniques and analyse the aircraft equations of rigid-body motion and to extract

stability characteristics. Course content will include static longitudinal aircraft stability: origin of symmetric forces and moments; static and manoeuvring longitudinal stability, equilibrium and control of rigid aircraft; aerodynamic load effects of wings, stabilisers, fuselages and power plants; trailing edge aerodynamic controls; trimmed equilibrium condition; static margin; effect on static stability of free and reversible controls.

AERO3660
Aerospace Management

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop knowledge and understanding of the current state of aerospace design, manufacturing, and operations in the Australian aviation industry. Students will gain skills in aerospace engineering management. On satisfactory completion of this unit, students will be able to apply risk management skills to a variety of industry situations and use appropriate methodology to manage these situations. Students will also become proficient in the use of Project Management tools and learn how to apply them to industry standard problems. Subject areas covered within the Unit of Study include principles and practice of aviation and airline management; discussion and analysis of airline operations; flight safety and airworthiness standards; risk and reliability management; and management in aerospace engineering design.

AERO3711
Space Engineering Project 2

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 2 hours of project meeting sessions per week. **Prerequisites:** AERO2711 Space Engineering Project 1; a WAM of > 75% is required as well as departmental permission from the Space Engineering Coordinator. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit of study is for those students who have completed Space Engineering Project 1, and who wish to extend their design into the prototype phase. Students who take this subject would be interested in manufacturing a sub-system for a real satellite or launch vehicle. This unit allows students to develop a deeper appreciation for the complexities of designing and building space sub-systems, and if completed successfully will allow the student to take further Space Engineering Projects towards the final development of a sub-system ready for launch.

AERO3760
Space Engineering 2

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of project work sessions per week. **Prerequisites:** AERO2705 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to provide students with a learning environment that promotes systems thinking and allows students to develop skills in systems analysis and design. In particular the UoS will focus on Aerospace systems, and students will develop both theoretical and practical skills in the area of systems engineering for this discipline. The primary objective is to develop fundamental systems engineering and systems thinking skills. At the end of this unit students will be able to: define the requirements process and be able to apply it to aerospace systems design.; conduct requirements analysis for an aerospace system and to drill down through requirements breakdown and the use of the V-diagram in this analysis; conduct functional and technical analysis and determine design drivers in a system; manage the use of a log book and its application in engineering design; develop technical skills in the design and development of satellite subsystems; conduct appropriate interaction processes between team members for the successful achievement of goals. Course content will include fundamentals of systems engineering; satellite subsystems; systems design.

AERO4206
Rotary Wing Aircraft

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours of tutorials per semester. **Prerequisites:** AERO3260 and AERO3560 **Assumed knowledge:** Prior Learning : concepts from 3rd Year Aerodynamics and Flight Mechanics will be applied to Rotary Wing Vehicles in this unit. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of the theory of flight, design and analysis of helicopters, auto-gyros and other rotary wing aircraft. Students will gain an appreciation of the extra difficulties involved when the vehicle flow is cyclic in nature. At the end of this unit students will be able to: Identify and predict the various flow states of a generic lift producing rotor; Use appropriate methods to determine the forces and torques associated with the rotor; Estimate values for typical stability derivatives for helicopters and be able to construct a simple set of stability analysis equations for the vehicle; become aware of the regulatory and liability requirements relating to all aspects of commercial helicopter operation and maintenance. Course content will include introduction to rotary wing aircraft; vertical flight performance; forward flight performance; blade motion and control; dynamics of rotors; rotor-craft stability; rotor blade design.

AERO4260
Aerodynamics 2

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** AMME2200 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to introduce students to: elementary and advanced topics in Gasdynamics (High Speed Flows). Course content will include review of Equations of Gasdynamics, One-Dimensional Gas Flow, Isentropic Flows, Normal Shock, Flow in a Converging and a Converging-Diverging Nozzle, Steady Two-dimensional Supersonic flow, Shock waves (Normal and Oblique), Method of Characteristics, Two-dimensional Supersonic Aerofoils, Introduction to Three-dimensional Effects, Unsteady Flows, Moving Shock, Shock Tube Flow and Transonic Flow and Compressible Boundary Layers. At the end of this unit the student will be able to calculate a high speed flow about an aerofoil and compressible flow through a duct of varying cross section and will have a good appreciation of Transonic and Hypersonic Flows.

AERO4360
Aerospace Structures 2

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** AERO3360 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to teach fundamentals of modern numerical and analytical techniques for evaluating stresses, strains, deformations and strengths of representative aerospace structures. In particular the focus is on developing an understanding of: Fundamental concepts and formulations of the finite element methods for basic structural analysis; Elements for typical aerospace structures, such as beams/frames, plates/shells, and their applications and limitations; Finite element techniques for various types of problems pertinent to aerospace structures; d)and, developing hands-on experience of using selected commercial finite element analysis program. At the end of this unit of study the following will have been covered: Introduction to Finite Element Method for modern structural and stress analysis; One-dimensional rod elements; Generalization of FEM for elasticity; Two- and three-dimensional trusses; FEA for beams and frames in 2D and 3D; Two-dimensional problems using constant strain triangular elements; The two-dimensional isoparametric elements; Plates and shells elements and their applications; FEA for axisymmetric shells and pressure vessels, shells of revolution; FEA for axisymmetric solids subjected to axi-symmetric loading; FEA for structural dynamics, eigenvalue analysis, modal response, transient response; Finite element analysis for stress stiffening and buckling of beams, plates and shells; Three-dimensional problems in stress analysis; Extensions to the element library, higher order elements, special elements;

Constraints; FEA modeling strategy; FEA for heat conduction; FEA for non-linear material and geometric analysis.

AERO4460
Aerospace Design 2

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of project work in-class per week. **Prerequisites:** AERO3260, AERO3261, AERO3360 and AERO3460 **Assumed knowledge:** AERO1400, AERO2703 and AERO3465 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of the application of design to the modern aerospace industry. Students will gain an overview of how to manage a design team and will also gain skills in carrying out detailed design problems. Course content will include: Design requirements; Sources of information for aircraft design; Configuration design: performance, weight and balance, propulsion; Aerodynamic design: lift, drag and control; Structural design: loads, materials; Philosophies of design and analysis; System design: requirements and specification; System design procedures; systems integration.

AERO4491
Advanced Aircraft Design

Credit points: 6 **Session:** Semester 2 **Classes:** 6 hours of project work in-class per week. **Prerequisites:** MECH2400 and AERO3460 **Assumed knowledge:** AERO1400, AERO2703, AERO3260, AERO3261, AERO3360, AERO3465 and AERO3560 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of the application of design to the modern aerospace context. Students will gain an overview of how to manage a project and its associated design team and will also gain skills in setting design specifications and carrying out detailed design analysis to meet some challenging requirement. Unit of Study content will include: Aircraft design methods; Methods of processing information for aircraft design: Detailed configuration design: performance, weight and balance, propulsion; Aerodynamic design: lift, drag and control; Advanced structural design, loads, materials; Weight estimation and fulfilling of relevant regulatory requirements; Advanced system design, modern aircraft requirements and specification; systems integration and validation; prototyping, benchmarking and testing.

AERO4560
Flight Mechanics 2

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of tutorials per week **Prerequisites:** AERO3560 and AMME3500 **Assumed knowledge:** AMME2500 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of the application of flight mechanics principles to modern aircraft systems. Students will gain skills in problem solving in the areas of dynamic aircraft behaviour, aircraft sensitivity to wind gusts, control systems development and aircraft handling analysis. At the end of this unit students will be able to: Uunderstand the nature of an aircraft's response to control inputs and atmospheric disturbances, including the roles of the various modes of motion; Analyse an aircraft's response to control inputs in the frequency domain using Laplace Transforms and Transfer Function representations; Represent and model wind gust distributions using stochastic methods (Power Spectral Density); Analyse an aircraft's response to disturbances (wind gust inputs) by combining Transfer Function representations with gust PSD's; Uunderstand the principles of stability augmentation systems and autopilot control systems in aircraft operation, their functions and purposes; Understand basic feedback control systems and classical frequency domain loop analysis; Understand the characteristics of closed loop system responses; Understand the characteristics of PID, Lead, Lag and Lead-Lag compensators, and to be competent in designing suitable compensators using Bode and Root-locus design techniques; Design multi-loop control and guidance systems and understand the reasons for their structures.

AERO4591
Advanced Flight Mechanics

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Prerequisites:** AERO3560 and AMME3500 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit aims to develop an understanding of the development of modern flight control, guidance, and navigation systems. Students will gain skills in analysis, problem solving and systems design in the areas of aircraft dynamic system identification and control. At the end of this unit students will be able to: understand the principles of stability augmentation systems and autopilot control systems in aircraft operation, their functions and purposes; understand the characteristics of closed loop system responses; understand advanced feedback control systems and state-space design techniques; understand the concepts of parameter and state estimation; design observers in the state space and to implement a Kalman Filter; be comfortable with multi-loop control and guidance systems and the reasons for their structures; appreciate flight test principles and procedures and to be capable of implementing a flight test programme.

AERO4701
Space Engineering 3

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** AERO3760 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS aims to teach students the fundamental principles and methods of designing solutions to estimation problems in aerospace engineering applications. Students will apply learned techniques in estimation theory to solving a wide range of different problems in engineering such as satellite positioning systems, satellite attitude determination, satellite orbit determination and remote sensing. Students will learn to recognize and appreciate the coupling between the different elements within an estimation task, such as satellite remote sensing, from a systems-theoretic perspective. Students will also use this system knowledge and basic design principles to design and test a solution to a given estimation task, with a focus on aerospace applications (such as satellite remote sensing).

AERO4711
Space Engineering Project 3

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 2 hours of project meeting sessions per week. **Prerequisites:** AERO3711 Space Engineering Project 2; a WAM of > 75% is required as well as departmental permission from the Space Engineering Coordinator. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit of study is for those students who have completed Space Engineering Projects 2, and who wish to formalise their design into the launch phase. Students who take this subject would be interested in manufacturing the final sub-system for a real satellite or launch vehicle. This unit allows students to develop a deeper appreciation for the complexities of designing and building space sub-systems, and provide an opportunity for the actual launch of the sub-system. Launch of the sub-system will be dependent on the current opportunities existing with international collaborators.

AERO4712
Space Engineering Project 4

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 2 hours of project meeting sessions per week. **Prerequisites:** AERO4711 Space Engineering Project 3; a WAM of > 75% is required as well as departmental permission from the Space Engineering Coordinator. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit of study is for those students who have completed Space Engineering Projects 3, and who wish to finalise their design by developing the interfacing and insertion phases into Satellite or Launch Vehicle system. Students who take this subject would have completed the previous three Space Engineering Projects, and have been

provided with the opportunity to place their system into an actual system. Launch of the sub-system will be dependent on the current opportunities existing with international collaborators.

AMME0011
International Exchange B

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment. Note:

An exchange component unit for students going on an International Exchange Program.

AMME0012
International Exchange C

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment. Note:

An exchange component unit for students going on an International Exchange Program

AMME0013
International Exchange D

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment. Note:

An exchange component unit for students going on an International Exchange Program

AMME0014
International Exchange E

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment. Note:

An exchange component unit for students going on an International Exchange Program.

AMME0015
International Exchange F

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment. Note:

An exchange component unit for students going on an International Exchange Program

AMME0016
International Exchange G

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment. Note:

An exchange component unit for students going on an International Exchange Program.

AMME0017
International Exchange H

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment. Note:

An exchange component unit for students going on an International Exchange Program

AMME0018
International Exchange I

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment. Note:

An exchange component unit for students going on an International Exchange Program

AMME1550
Dynamics 1

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours of tutorials per week **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of the basic methods required to perform kinematics and dynamic analysis on particles. By the end of this unit of study students will be able to solve complicated kinematics and dynamics problems of particles in both 2 and 3 dimensions.

AMME2200
Thermodynamics and Fluids

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Assumed knowledge:** MATH1001; MATH1002; MATH1003. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to teach the basic laws of thermodynamics and the fundamentals of fluid statics and dynamics. At the end of this unit students will have: an understanding of the basic laws of thermodynamics and basic equations governing the statics and dynamics of fluids; the ability to analyze the thermodynamics of a simple open or closed engineering system; the ability to analyze and determine the forces governing static fluid; the ability to evaluate the relevant flow parameters for fluid flow in internal engineering systems such as pipes and pumps (velocities, losses, etc.) and external systems such as flow over wings and airfoils (lift and drag). Course content will include concepts of heat and work, properties of substances, first law of thermodynamics, control mass and control volume analysis, thermal efficiency, entropy, second law of thermodynamics, reversible and irreversible processes, isentropic efficiency, power and refrigeration cycles; basic concepts of pressure, force, acceleration, continuity, streamline and stream function, viscosity, non-dimensional parameters; Fluid statics: governing hydrostatic equations, buoyancy; Fluid dynamics: governing conservation equations; Potential flow, vorticity and circulation; Bernouilli and Euler equations; A brief introduction to flow measuring devices, pipe flow, flow over surfaces, lift and drag.

AMME2301
Mechanics of Solids

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Prerequisites:** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (MATH1003 or MATH1903 or MATH1907), (ENGG1802 or PHYS1001 or PHYS1901) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Equilibrium of deformable structures; basic concept of deformation compatibility; stress and strain in bars, beams and their structures subjected to tension, compression, bending, torsion and combined loading; statically determinate and indeterminate structures; energy methods for bar and beam structures; simple buckling; simple vibration; deformation of simple frames and cell box beams; simple two-dimensional stress and Morh's circle; problem-based applications in aerospace, mechanical and biomedical engineering.

AMME2302
Materials 1

Credit points: 6 **Session:** Semester 1 **Classes:** 1 hour of lectures, 2 hours of tutorials per week. 3 hours of laboratory work per semester. **Prohibitions:** CIVL2110 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

AMME2302 is an introductory course in engineering materials. The unit aims to develop students' understanding of the structures, mechanical properties and manufacture of a range of engineering materials as well as how the mechanical properties relate to microstructure and forming and treatment methods. The unit has no prerequisite subject and is therefore intended for those with little or no previous background in engineering materials. However the unit does require students to take a significant degree of independent responsibility for developing their own background knowledge of materials and their properties. The electrical, magnetic, thermal and

optical properties of materials are a critical need-to-know area where students are expected to do most of their learning by independent study.

AMME2500
Engineering Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. 6 hours of laboratory work per semester. **Prerequisites:** (MATH1001 or MATH1901 or MATH1906), (MATH1002 or MATH1902), (AMME1550 or PHYS1001 or PHYS1901) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to teach: Dynamics of Rigid Bodies: Analysis of Planar mechanisms; Kinematics of rigid bodies; Kinetics of rigid bodies. Students will also develop their skills in: how to model and analyse dynamic systems and the application of theory to real systems through practical/laboratory sessions.

At the end of this unit students will have developed skills in modelling and analysing planar mechanisms and rigid body dynamic systems.

Course content will include planar mechanisms, linkages, mobility; instant centres of rotation, Kennedy's theorem; velocity and acceleration polygons; kinematics of rigid bodies, frames of reference, velocity and acceleration, rotating frame of reference, relative velocity and acceleration, gyroscopic acceleration; kinetics of rigid bodies, linear momentum and Euler's first law; angular momentum and Euler's second law; centre of mass; moments of inertia, parallel axis and parallel plane theorems, principal axes and principal moments of inertia, rotation about an axis; impulse and momentum; work and energy, kinetic and potential energies; applications to orbital and gyroscopic motion; introduction to Lagrangian methods.

AMME3110
Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** no formal classes **Prohibitions:** AMME4110 Project B **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Supervised project on a relevant engineering discipline.

AMME3500
System Dynamics and Control

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of tutorials per week **Prerequisites:** AMME2500; (MATH2061 or MATH2961 or MATH2067) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to allow students to develop an understanding of methods for modeling and controlling linear, time-invariant systems. Techniques examined will include the use of differential equations and frequency domain approaches to modeling of systems. This will allow students to examine the response of a system to changing inputs and to examine the influence of external stimuli such as disturbances on system behaviour. Students will also gain an understanding of how the responses of these mechanical systems can be altered to meet desired specifications and why this is important in many engineering problem domains.

The study of control systems engineering is of fundamental importance to most engineering disciplines, including Electrical, Mechanical, Mechatronic and Aerospace Engineering. Control systems are found in a broad range of applications within these disciplines, from aircraft and spacecraft to robots, automobiles, computers and process control systems. The concepts taught in this course introduce students to the mathematical foundations behind the modelling and control of linear, time-invariant dynamic systems.

In particular, topics addressed in this course will include:

1. Techniques for modelling mechanical systems and understanding their response to control inputs and disturbances. This will include the use of differential equations and frequency domain methods as well as tools such as Root Locus and Bode plots.

2. Representation of systems in a feedback control system as well as techniques for determining what desired system performance specifications are achievable, practical and important when the system is under control

3. Theoretical and practical techniques that help engineers in designing control systems, and an examination of which technique is best in solving a given problem.

AMME4010
Major Industrial Project

Credit points: 24 **Session:** Semester 1, Semester 2 **Classes:** no formal classes **Prerequisites:** (36 credits of 3rd year units of study) **Prohibitions:** AMME4111,AMME4112,AMME4121,AMME4122 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Passed at least 144 credit points. Departmental permission required for enrolment

Students spend 6 months at an industrial placement working on a major engineering project relevant to their engineering stream. This is a 24 credit point unit, which may be undertaken as an alternative to AMME4100 Practical Experience, AMME4111/4112 Honours Thesis A & B, MECH4601 Professional Engineering 2 and a recommended elective. This unit of study gives students experience in carrying out a major project within an industrial environment, and in preparing and presenting detailed technical reports (both oral and written) on their work. The project is carried out under joint University/industry supervision, with the student essentially being engaged fulltime on the project at the industrial site.

AMME4110
Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time **Prohibitions:** AMME3110 Project A **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Supervised project on a relevant engineering discipline.

AMME4111
Honours Thesis A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time, **Prerequisites:** 36 credit points of senior units of study and 2nd/3rd year WAM of 65% or greater **Corequisites:** AMME4112 **Prohibitions:** AMME4121, AMME4122, AMME4010 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The fourth year honours thesis aims to provide students with the opportunity to carry out a defined piece of independent research in a setting and in a manner that fosters the development of engineering research skills. These skills include the capacity to define a research question, showing how it relates to existing knowledge, identifying the tools needed to investigate the question, carrying out the research in a systematic way, analysing the results obtained and presenting the outcomes in a report that is clear, coherent and logically structured. Honours thesis is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Honours Thesis A covers first steps of thesis research starting with development of research proposal. Thesis B covers the second of stage writing up and presenting the research results. Students are asked to write a thesis based on a research project, which is very often related to some aspect of a staff member's research interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of equipment. Direction of thesis work may be determined by the supervisor or be of an original nature, but in either case the student is responsible for the execution of the practical work and the general layout and content of the thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers

and supervisors as part of a seminar program. It is not expected that a thesis at this level will represent a significant contribution to new knowledge; nor is it expected that theses will resolve great intellectual problems. The timeframe available for the thesis is simply too short to permit students to tackle complex or difficult problems. Indeed, a key aim of the thesis is to specify a research topic that arouses sufficient intellectual curiosity, and presents an appropriate range and diversity of technical and conceptual challenges, while remaining manageable and allowing achievable outcomes within the time and resources available. It is important that the topic be of sufficient scope and complexity to allow a student to learn their craft and demonstrate their research skills. Equally imperative is that the task not be so demanding as to elude completion.

AMME4112
Honours Thesis B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time, **Prerequisites:** AMME4111 Honours Thesis A **Prohibitions:** AMME4121, AMME4122, AMME4010 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The fourth year honours thesis aims to provide students with the opportunity to carry out a defined piece of independent research or design work in a setting and in a manner that fosters the development of engineering skills in research or design. These skills include the capacity to define a research or design question, showing how it relates to existing knowledge, identifying the tools needed to investigate the question, carrying out the research or design in a systematic way, analysing the results obtained and presenting the outcomes in a report that is clear, coherent and logically structured. Honours thesis is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Honours Thesis A covers first steps of thesis research starting with development of research proposal. Thesis B covers the second of stage writing up and presenting the research results. Students are asked to write a thesis based on a research or major design project, which is very often related to some aspect of a staff member's research interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of equipment. Direction of thesis work may be determined by the supervisor or be of an original nature, but in either case the student is responsible for the execution of the practical work and the general layout and content of the thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program. It is not expected that a thesis at this level will represent a significant contribution to new knowledge; nor is it expected that theses will resolve great intellectual problems. The time frame available for the thesis is simply too short to permit students to tackle complex or difficult problems. Indeed, a key aim of the thesis is to specify a research or design topic that arouses sufficient intellectual curiosity, and presents an appropriate range and diversity of technical and conceptual challenges, while remaining manageable and allowing achievable outcomes within the time and resources available. It is important that the topic be of sufficient scope and complexity to allow a student to learn their craft and demonstrate their research or design skills. Equally imperative is that the task not be so demanding as to elude completion.

AMME4121
Engineering Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time **Prerequisites:** 36 credit points of senior units of study. **Corequisites:** AMME4122 **Prohibitions:** AMME4111, AMME4112, AMME4010 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To complete the research requirement for their engineering degree, students now have a choice of either completing Honours Thesis A/B (AMME 4111/AMME4112) or Project A/B (AMME 4121/AMME4122) in 2009. Project A/B is intended to be more practical in orientation while Thesis A/B demands extensive literature review and critical analysis of outcomes. Honours Thesis is a program for individuals whereas Projects can be done by groups or by an individual. Engineering Project A/B is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Engineering Project A covers first steps of project work, starting with development of project proposal. Project B covers the second of stage writing up and presenting the project results. The fourth year engineering project aims to provide students with the opportunity to carry out a defined piece of independent design work in a setting and in a manner that fosters the development of engineering design skills. These skills include the capacity to define a engineering design problem, showing how it relates to prior art, identifying appropriate tools and methods, carrying out a design in a systematic way and presenting outcomes in a report that is clear, coherent and logically structured

AMME4122
Engineering Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time **Prerequisites:** AMME4121 Engineering Project A **Prohibitions:** AMME4111, AMME4112, AMME4010 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To complete the research requirement for their engineering degree, students now have a choice of either completing Honours Thesis A/B (AMME 4111/AMME4112) or Project A/B (AMME 4121/AMME4122) in 2009. Project A/B is intended to be more practical in orientation while Thesis A/B demands extensive literature review and critical analysis of outcomes. Honours Thesis is a program for individuals whereas Projects can be done by groups or by an individual. Engineering Project A/B is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Engineering Project A covers first steps of project work, starting with development of project proposal. Project B covers the second of stage writing up and presenting the project results. The fourth year engineering project aims to provide students with the opportunity to carry out a defined piece of independent design work in a setting and in a manner that fosters the development of engineering design skills. These skills include the capacity to define a engineering design problem, showing how it relates to prior art, identifying appropriate tools and methods, carrying out a design in a systematic way and presenting outcomes in a report that is clear, coherent and logically structured

AMME4210
Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** 1 hour of lectures, 1 hour of tutorial and 2 hours of computer lab work per week **Prerequisites:** MECH3261 or AERO3260 **Assumed knowledge:** Partial differental equations, finite difference methods, linear algebra, matrix methods, pressure, force, acceleration, continuity, streamline and streamfunction, viscosity, control parameters, non-dimensionalisation. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The aim of this unit is to provide students with an understanding of the theoretical basis of computational fluid dynamics, the ability to write a simple Navier-Stokes solver and the skills to use a state of the art commercial computational fluid dynamics package. At the end of this unit students will have the ability to assess fluid mechanics problems commonly encountered in industrial and environmental settings, construct and apply computational models, determine critical control parameters and relate them to desired outcomes and write reports. Course content will include Navier-Stokes equations; finite difference methods; accuracy and stability for the advection and diffusion equations; direct and iterative solution techniques; solution

of the full Navier-Stokes equations; turbulent flow; cartesian tensors; turbulence models.

AMME4241
Renewable Energy

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hour of tutorials per week **Prerequisites:** MECH3260, MECH3261 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop understanding of the engineering design and analysis of different devices and technologies for generating power from renewable sources including: solar, wind, wave, tidal, ocean thermal, geothermal, hydro-electric, and biofuels; to understand the environmental, operational and economic issues associated with each of these technologies. At the end of this unit students will be able to perform in depth technical analysis of different types of renewable energy generation devices using the principles of fluid mechanics, thermodynamics and heat transfer. Students will be able to describe the environmental, economic and operational issues associated with these devices.

AMME4500
Guidance and Control

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** AMME3500. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study will extend the concepts of control theory taught in 3rd year into the broader realm of Guidance and Control (G&C) systems for autonomous vehicles. Students will study the fundamental concepts of G&C with its specific implementation to autonomous space, air, ground and underwater vehicles. Students will also learn about navigation systems and their synergistic role with G&C systems. The unit of study will present a number of real case studies as well as experiential learning through the development of G&C algorithms.

AMME4660
Management, Employees and Industrial Rel

Credit points: 6 **Session:** Semester 2 **Classes:** 5 hours of tutorial/work group sessions per week **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of industrial relations issues in Australia, Government regulations, awards and agreements, and how they relate to companies, management, employers, employees, and unions. Students will develop skills and understanding of Australian regulations and awards, negotiation of workplace agreements, enterprise bargaining agreements, and working with unions. The course will be viewed from the perspective of all players in the system so that a new graduate, who will at some time fit all categories, has an understanding of employer/employee relationships in the workforce. Guest lecturers will be invited from industry (management, unions, etc.) to present their experiences in industrial relations. Role playing will be used to simulate working environments to develop skill in handling grievances, resolving conflicts, and develop negotiating skills. By the end of this unit of study students will be better prepared to enter the workforce as both an employee and as a manager.

AMME4710
Computer Vision and Image Processing

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours of laboratory work per week **Assumed knowledge:** MECH4720 or MECH4730 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study introduces students to vision sensors, computer vision analysis and digital image processing. This course will cover the following areas: fundamental principles of vision sensors such as physics laws, radiometry, CMOS/CDD imager architectures, colour reconstruction; the design of physics-based models for vision such as reflectance models, photometric invariants, radiometric calibration. This course will also present algorithms for video/image analysis, transmission and scene interpretation. Topics such as image enhancement, restoration, stereo correspondence, pattern recognition, object segmentation and motion analysis will be covered.

AMME4790
Introduction to Biomechatronics

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Prerequisites:** MTRX3700 or MECH3921 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Biomechatronics is the application of mechatronic engineering to human biology and as such it forms an important subset of the overall biomedical engineering discipline. It involves the following: Active and passive prosthetic limbs and joints; Active implants; Bio interfaces for diagnostics and control; Sensing & biofeedback; Bio electrical signal processing; Haptic devices; Tele surgery; Robot based surgery; Medical imaging; Mobility aids, rehabilitation devices & home care, and care of aged; The future.

AMME4971
Tissue Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hrs of tutorials per week. **Prerequisites:** 6cp of junior biology; 6cp of junior chemistry; MECH2901 **Assumed knowledge:** MECH3921 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

With the severe worldwide shortage of donor organs and the ubiquitous problem of donor organ rejection, there is a strong need for developing technologies for engineering replacement organs and other body parts. Recent developments in biochemistry and cell biology have begun to make this possible, and as a consequence, the very new field of tissue engineering has been making dramatic progress in the last few years. This UoS will provide an introduction to the principles of tissue engineering, as well as an up to date overview of recent progress in the field of tissue engineering is and where it is going. This UoS assumes prior knowledge of cell biology and chemistry and builds on that foundation to elaborate on the important aspects of tissue engineering.

The objectives are:

1. To gain a basic understanding of the major areas of interest in tissue engineering

2. To learn to apply basic engineering principles to tissue engineering systems

3. To understand the challenges and difficulties of tissue engineering.

4. Understand the ethical issues of stem cell applications.

5. Practical classes in the preparation and evaluation of scaffolds for tissue regeneration.

6. Enable student to access web-based resources in tissue engineering (for example: Harvard-MIT Principles and Practice of Tissue Engineering).

7. Research basic skills in Tissue Engineering.

AMME4981
Applied Biomedical Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hour workgroup sessions per week **Prerequisites:** 6cp of junior biology; 6cp of junior chemistry; AMME2302 **Assumed knowledge:** MECH3921, MECH3362 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Computer simulation is a very important aspect of engineering in general, and biomedical engineering specifically. This is because it overcomes the problems of clinical, ethical, and design considerations involved in testing early prototypes on live subjects. This unit of study will take a project-based-learning approach to the topic of computer simulation and design optimization of biomedical devices through lectures and facilitated design work and group seminars. The primary focus will be on finite element modeling, and biomedical implantable devices. After some weeks of lectures on these topics, students will form into teams and use computer simulation techniques to develop and optimize their design. Projects are to be conducted in collaboration with companies in the biomedical industry, and it is anticipated that students will spend a significant amount of time with their host company. It is anticipated that students will gain detailed knowledge

not only in the design topic assigned to them, but also in the topics assigned to their peers.

AMME4990
Biomedical Product Development

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** 6 credit points of junior biology 6 credit points of junior chemistry MECH2901 or 6 credit points of intermediate physiology or equivalent MECH3921 **Assumed knowledge:** Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Product development in the biomedical area presents unique challenges that need to be addressed to efficiently satisfy strict regulatory requirements and to successfully advance products to approval for marketing. Biomedical engineers need a broad understanding of these challenges as the main components of product development are complex and interdependent. Development of good manufacturing and quality control processes, preclinical and clinical validation of product safety and efficacy, and regulatory filings, are each progressive and interdependent processes. This UoS will provide a broad understanding of regulatory requirements for biomedical product development, with particular emphasis on the dependence of each component on the development of processes and control systems that conform to Good Manufacturing Practice. This UoS assumes prior knowledge of cell biology and chemistry and builds on that foundation to elaborate on the important aspects of biomedical product development.

AMME4992
Regulatory Affairs in Medical Industry

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hour weekly lecture **Prerequisites:** 6 credit points of junior biology 6 credit points of junior chemistry MECH2901 or 6 credit points of intermediate physiology or equivalent MECH3921 **Assumed knowledge:** Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Supply of medical devices, diagnostics and related therapeutic products is regulated in most jurisdictions, with sophisticated and complex regulatory regimes in all large economies. These regulations are applied both to manufacturers and designers and to biomedical engineers undertaking device custom manufacture or maintenance in clinical environments. This UoS will explore the different regulatory frameworks in the "Global Harmonisation Task Force" group of jurisdictions (US, EU, Canada, Japan, Australia) as well as emerging regulatory practices in Asia and South America. Emphasis will be on the commonality of the underlying technical standards and the importance of sophisticated risk management approaches to compliance.

MECH1400
Mechanical Construction

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures and 3 hours of workshop practice per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Learn about selected historical events, research methods, analysis techniques, application of theory and analysis to real machinery, use of machine and hand tools. This is a project based subject where the students will build their own designs. Historical developments in the area of the project selected. Research into the necessary fields to fully understand and analyse the project. Review and improve workshop skills. Student designs their own version of the project. Build the project in the workshop. Test the completed machine. The unit ties in with workshop component of MECH1560. Skills developed become relevant in MECH2400 Mechanical Design 1

MECH1560
Introduction to Mechanical Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** (1hr lec, 2hrs tut, 3hrs workshop) per week **Prohibitions:** AERO1560, MTRX1701, ENGG1800 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Objectives:

a) To develop an understanding of the role of Mechanical Engineers.

b) To understand the content of the degree structure and how the subjects are applied.

c) To develop an understanding of a range of machining and manufacturing processes required to make mechanical components.

Introductory Mechanical Engineering (50%): Subject introduces the Mechanical Engineering degrees. An overview of the range of roles of a Mechanical Engineer (people, case studies, guests, etc.). The skills/knowledge required of an engineer and the relationship between the subjects in the degree program and how they are applied by practicing engineers. Fundamentals of machinery and equipment common to this degree, with some introductory analysis techniques and problem solving methods.

Manufacturing Technology (50%): Safety requirements: All students are required to comply with the safety regulations. Students who fail to do this will not be permitted to enter the workshops. In particular, approved industrial footwear must be worn, and long hair must be protected by a hair net. Safety glasses must be worn at all times. Workshop Technology practical work in: (a) Fitting . Measurement, marking, hammers, cutting, tapping and screwing, reaming and scraping. (b)Machining . lathe, mill, grinder, drill, shaper, and finishing operations. (c)Welding . Practical work in gas and electric welding. (d)Blacksmithing and forging. (e) Foundary . moulding and casting.

MECH2400
Mechanical Design 1

Credit points: 6 **Session:** Semester 2 **Classes:** 2hr Lectures; 3hrs tuts/lab per week **Corequisites:** AMME2301 **Assumed knowledge:** ENGG1802,AMME2302 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aim: For students to experience a realistic the design process and to develop good engineering skills.

Course Objectives: To develop an understanding of:

1. the need for and use of standard drawings in the communication and definition of parts and assemblies,

2. Efficient use of a CAD package

3. creativity,

4. the design process from initial idea to finished product

5. Methods used to analyse designs

6. standard components

MECH2901
Anatomy and Physiology for Engineers

Credit points: 6 **Session:** Semester 2 **Classes:** 2.5 hours of lectures per week. 12 hours of laboratory work per semester. **Assumed knowledge:** A basic understanding of biology. Recommended: BIOL1003 (or equivalent) **Campus:** Cumberland **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study provides the underpinning knowledge needed in biomedical engineering designs. It is not a pre-requisite for any units of study. However, the anatomic and physiological functional knowledge gained in this subject will enhance prototype development of biomedical designs. Students should gain familiarity with anatomical and physiological terms and their meaning, understanding of the gross anatomy of the major systems in the human body and their importance in the design of biomedical devices and understanding of the major physiological principles which govern the operation of the human body.

MECH3260
Thermal Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. 6 hours of laboratory work per semester. **Prerequisites:** AMME2200 **Assumed knowledge:** Fundamentals of thermodynamics are needed to begin this more advanced course. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To develop an understanding of the principles of thermodynamic cycles, gas mixtures, combustion and thermochemistry applied to engineering processes, power and refrigeration systems. To understand heat transfer equipment design. To classify heat transfer situations as conduction, convection, radiation, forced or natural convection. To determine the appropriate approach to problems, the type of solution needed, analytical or numerical. To be able to arrive at a solution and predict heat transfer rates and be able to design and size heat transfer equipment.

MECH3261
Fluid Mechanics

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. 3 hours of laboratory work per semester. **Prerequisites:** AMME2200 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to provide students with a detailed understanding of the theory and practice of fluid mechanics in the context of mechanical engineering. Students will gain skills in problem solving in areas of pipe, pump and channel flow; lift and drag on immersed bodies; boundary layer theory and gas dynamics. At the end of this unit students will have the ability to critically assess and solve problems commonly found in fluid mechanics practice, such as sizing pumps and piping systems, designing channels, and determing the lift and drag characteristics of submerged bodies. Additionally, they will develop a structured and systematic approach to problem solving.

MECH3361
Mechanics of Solids 2

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. 6 hours of laboratory work per semester. **Prerequisites:** AMME2301 and AMME 2302 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to: teach the fundamentals of analyzing 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 analyze 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 modeling; 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 introduce plates and shells and how to do analysis for plate and shell structures; 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 ultimate outcome is that the students have the ability to solve engineering problems by comprehensively using the skills attained above.

MECH3362
Materials 2

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. 3 hours of laboratory work per semester **Prerequisites:** AMME2301 and AMME2302 **Assumed knowledge:** This subject requires you to have two important skills to bring in: (1) A good understanding of basic knowledge and principles of material science and engineering from AMME2302 Materials I and mechanics of solids for simple structural elements (in tension, bending, torsion) from AMME2301 ; (2) Reasonable mathematical skills in calculation of stresses and strains in simple structural elements. **Campus:** Camperdown/Darlington **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.

MECH3460
Mechanical Design 2

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** MECH2400 and AMME2301 **Assumed knowledge:** Properties of engineering materials including fatigue failure theories. Statics and dynamics properties of machines. Practical use of Word and Excel including the use of the `solver' and graphing capabilities built into the spreadsheet. The use of a spreadsheet is mandatory. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to apply some newly acquired skills to begin to understand how stress and strain are distributed in the more common categories of machine parts. Reducing the loads in standard parts to just the most significant, leads to a range of relatively simple analyses. By using different degrees of simplification and a proportional amount of effort, the examination of components can provide results of corresponding accuracy. To lead the student to utilize and be aware of modern computer methods, to be aware of past methods and be prepared of future developments. Not all the analysis of mechanical components are covered in the course but the ones that are deal with exemplify principles that can be applied to novel items that our graduates may encounter in their professional life.

At the end of this unit students will be able to: calculate the weld thickness at a welded joint that is required to carry any combination of loads and apply fatigue life prediction in general to any component; design a bolted joint to carry tensile and or shear loads: use a numerical solver to arrive at the optimal dimensions of a component, given its loads and sufficient boundary conditions; design shafts to carry specified steady and alternating bending moments and torques; design and construct a space frame, such as that for a dune buggy, to meet requirements of strength and rigidity; be able to arrive at the principle parameters of a pair of matched spur gears, and to be able to extend this to helical gears.

Course content will include: stress and strain in engineering materials; yield and ultimate fail conditions in malleable and brittle materials; spatial, 3D frameworks; deflections due to forces, moments and torques.

MECH3660
Manufacturing Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** (AERO1560 or MECH1560 or MTRX1701 or ENGG1800 or ENGG1805) and (ENGG1802 or PHYS1001 or PHYS1901) **Assumed knowledge:** AMME2200, AMME2301, AMME2302 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit aims to teach the fundamentals of manufacturing processes and systems in mechanical, mechatronic and biomedical engineering, including traditional and advanced manufacturing technologies. This unit aims to develop the following attributes: to understand the fundamental principles of manufacturing technologies for the above mentioned engineering areas; to gain the ability to select existing manufacturing processes and systems for direct engineering applications; to develop ability to create innovative new manufacturing technologies for advanced industrial applications; to develop ability to invent new manufacturing systems

At the end of this unit students will have a good understanding of the following: merits and advantages of individual manufacturing processes and systems; principles of developing new technologies;

comprehensive applications and strategic selection of manufacturing processes and systems.

Course content will include:

Manufacturing Processes: Common processes and their science (machining, casting, powder metallurgy, metal working, welding, polymer processing and composite manufacture); merits and limitations; NC and CAM; Introduction to advanced processes (sensor and actuator, IC, intelligent robots and biomedical and nano-technological device).

Manufacturing Systems: Economics in manufacturing; flexible manufacturing; just-in-time manufacturing; group technology; materials selection and requirements planning; quality control; introduction to new technology; introduction to e-manufacturing; human factors; plant layout.

MECH3661
Engineering Management

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Assumed knowledge:** It is expected that students will understand the concepts previously presented in ENGG1803 Professional Engineering. It is assumed that the students have an understanding of professional engineering issues, and are experienced in academic writing (both essays and reports), including appropriate referencing techniques, oral presentations and the project management process (particularly in group situations). Such previous knowledge will assist students in the development their awareness of the issues involved with engineering management. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to: develop an understanding of the principles and practices of industrial and engineering management; provide an understanding of the theoretical and practical issues facing an industrial organisation and the fundamental approaches to their management; understand the ethical, social, economic and environmental contexts of professional engineering within an industrial organization. The attributes that will be developed in this unit of study are consistent with the development of scholarship, global citizenship and lifelong learning.

At the end of this unit students will be able to: understand the fundamental approaches to industrial management; apply a range of these approaches in class experiences and assessment tasks; practice and appreciate the effective management of workgroups; understand the importance of effective design and management of human systems in managing organisational and professional issues; develop an ethical approach to dealing with professional issues of an economic, social or environmental nature; enhance competence and confidence in oral and written communication.

The concepts covered in this unit are from the following management areas:

Engineers and Management - including ethics , Communication and People in Organisations, Economics, Leadership, Strategic Management, Managerial Decision Analysis, Marketing, Business Planning, Legal Environment of Business, Industrial Hazard Management, Human Resource Management, Project Management, Quality Assurance and Management, Operations Management, and Financial Management.

This broad range of topics is covered so as to familarise students with the fundamental areas of managerial practice that they can be expected to become professionally proficient in.

MECH3921
Biomedical Design and Technology

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lectures/tutorials per week. These include site visits. **Assumed knowledge:** BIOL1003; MECH2901; AMME2302; MECH2400 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to give students an understanding of the Australian and International biomedical industry and in the development, manufacture and uses of biomedical engineering products in therapeutic, rehabilitation and clinical settings. Students will gain an understanding of the process of biomedical regulation in Australia and other major international markets as well as the entire process of creating a new biomedical engineering product, from design through to marketing and monitoring of the product. Students will design a biomedical device including the preparation of a detailed design brief.

This will be done as a team project. Each team will work on a specific biomedical design project following formal design protocols, including design control, regulatory considerations, and commercialisation/IP considerations.

Course content will include:

- Biomedical Design: A team design project on a medical device.
- Intellectual Property in the biomedical industry.
- Biomedical devices and technology.
- Regulatory and clinical considerations in the biomedical industry.
- Commercialisation strategies in the biomedical industry.
- The Australian biomedical industry - an overview. Includes site visits.
- The global biomedical industry - an overview.

MECH4241
Energy and the Environment

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** 24 credit points of third year units of study **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit is suitable for any engineering discipline student who is interested in developing an understanding of analysis and design in energy, power generation, environment and relevant economic issues. The aim is to acquaint students with the methods engineers use to design and evaluate the thermal processes used for the production of electricity. It also assesses and deals with the environmental consequences of power generation. At the end of this unit students will be able to carry out preliminary design and economic impact analyses for electrical power generation systems. A series of topics will be covered in relation to energy and electricity and relevant issues.

The course contents will include:

1. Economic analysis of energy systems;
2. Environmental impact of power generation;
3. Principles of thermodynamics;
4. First law analysis of power cycles;
5. Design and simulation of power generation cycles;
6. Second law efficiency and availability;
7. Energy efficiency;
8. CO2 capture and sequestration;
9. Design of various components of thermal power plants.

MECH4255
Air Conditioning and Refrigeration

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 1 hour of tutorials per week **Prerequisites:** MECH3260; MECH3261 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS aims to teach the basic principles of refrigeration and comfort air conditioning in the built environment including thermal load estimation, system selection, air distribution and energy analysis. Topics covered in this UoS include applied psychrometrics, air conditioning systems, design principles, comfort in the built environment. cooling load calculations, heating load calculations, introduction and use of computer-based load estimation packages software, air distribution, fans, ducts, air conditioning controls, refrigeration cycles, evaporators, condensers, cooling towers, compressors, pumps, throttling devices, piping, refrigerants, control, refrigeration equipment, stimulation of refrigeration systems, food refrigeration and industrial applications; use of CFD packages as tools to simulate flows in building and to optimise air conditioning design, energy estimation methods and software, energy evaluation and management in the built environment.

MECH4265
Combustion

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 1 hour of tutorials per week **Prerequisites:** MECH3260; MECH3261 **Assumed knowledge:** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS aims to teach the basic principles of combustion highlighting the role of chemical kinetics, fluid mechanics, and molecular transport in determining the structure of flames. Students will become familiar with laminar and turbulent combustion of gaseous and liquid fuels including the formation of pollutants. They will also be briefly introduced to various applications such as internal combustion engines, gas turbines, furnaces and fires. This UoS will cover equilibrium compositions, flammability limits, simple chemically reacting systems, detailed chemical kinetics, and the basic theory underlying laminar and turbulent combustion for both premixed and non-premixed cases. There will be an introduction to droplet combustion, the concept of mixture fraction for non-premixed flames, combustion in engines and gas turbines as well as the formation of pollutants. Fire ignition, growth and spread will also be covered with respect to safety in buildings including the hazards related to the formation of smoke and toxic products.

MECH4310
Advanced Engineering Materials

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. 3 hours of laboratory work per fortnight. **Prerequisites:** MECH3362 **Assumed knowledge:** This subject requires you to have a good understanding of basic knowledge and principles of various aspects for materials engineering UoS (e.g. 2nd & 3rd year Materials I and II, 2nd year Solids 1 and 3rd year Solids 2) especially those relevant to materials engineering and technology over the past 3.5 years. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims for students to understand: how to define the relationship between properties and microstructures of advanced engineering materials; how to improve mechanical design with the knowledge of mechanics and properties of materials; how to conduct failure diagnosis of engineering structures.

At the end of this unit students should be able to: define structure-property relationships of advanced engineering materials; improve the performance of engineering structures through tailoring materials microstructure and manufacturing processes; conduct failure diagnosis of simplified failure cases of engineering structures.

Course content will include: advanced ceramics, superalloys, shape memory alloys and polymers, advanced polymer matrix composites, piezoceramic materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, structure integrity and reliability, toughening mechanisms.

MECH4460
Mechanical Design 3

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** MECH2400 **Assumed knowledge:** ENGG1802, AMME2301, AMME2500, MECH3361 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit teaches the student how to recognise where and how their theoretical skills can be applied to the practical situations that they may encounter in this field of design. The unit utilises assumed theoretical knowledge and skills to elucidate the stresses and strains that exit in the different categories of machine parts. It sets out to make the students familiar with the simplifications that are applied to arrive at the analytic expressions commonly used to analyse the individual categories parts. These simplifications usually begin by assuming that only particular types of loads are carried by each category. The resulting analyses provide approximations to the actual stresses and it is possible to have different degrees of simplifications, requiring more or less work, giving better or worse approximations. Should a particular part be used to carry loads that were not allowed for in the traditional method then some more appropriate method must be found or developed. An important aspect is to make the student practiced in a range of modern concepts, techniques and tools, and to be made aware of their strengths and limitations. Options may be provided in the choice of design assignments. Biomedical engineering and vehicle design problems may be provided as options to more general machine design problems.

MECH4601
Professional Engineering 2

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of tutorials per week **Prerequisites:** MECH3660 **Assumed knowledge:** MECH3661, ENGG1803, AMME4100 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to create an awareness of issues surrounding the management of projects; impart knowledge resulting in a more global approach to the practice of engineering and engineering management; and provide a vehicle for improving communication skills (both written and oral). The course also aims, when taken together with other courses offered by the School, to substantially meet the requirement of the Institution of Engineers, Australia, for undergraduate training in management theory. On completion of this unit students should be able to: plan small projects and contribute effectively to planning of larger projects; work effectively in small teams; understand their role and expected conduct in the management of engineering projects; perform well in that role from the outset, with performance limited only by experience; prepare an interesting and relevant presentation on aspects of their work for their peers or senior managers; recognise the range of expertise they may need to call on in their role as an engineer working on a project (e.g. in safety and environmental fields); understand what the experts are saying, and be able to contribute effectively to that discussion; understand relationships between humans and the physical and psychological aspects of their occupations and develop basic competence in principles of ergonomics.

MECH4720
Sensors and Signals

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** MTRX3700 **Assumed knowledge:** Strong Matlab skills **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit aims to provide students with a good practical knowledge of a broad range of sensor technologies, operational principles and relevant signal processing techniques. MECH4720 is the last in a series of practical Mechatronic and Electrical courses taken over three years. It takes these practical engineering concepts, along with the associated mathematical, electronic and mechanical theory and applies this knowledge to a series of practical, albeit specialized applications that will be encountered by most Mechatronic Engineers at sometime during their careers.

This unit will starts by looking at signal characteristics, modulation, filtering and convolution before examining some passive sensors. It goes on to provide an overview of the workings of typical active sensors with a strong emphasis on optical systems and image processing (Radar, Lidar and Sonar). It provides insight into basic sensing methods as well as aspects of interfacing and signal processing. It includes both background material and a number of case studies.

At the end of this unit students will have a good understanding of passive and active sensors, their outputs and applicable signal processing techniques; an appreciation of the basic sensors that are available to engineers and when they should be used.

MECH4730
Computers in Real-Time Control and Inst

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of laboratory work per week. **Prerequisites:** MTRX3700 **Prohibitions:** ELEC4602 Real Time Computing **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims for students to: learn the fundamental principles and requirements of real time software design: understand the basic

components of an embedded systems; learn, appreciate and understand the various stages that need to be completed in a large software system implementation; learn the capabilities of a typical high performance real time operating system.

At the end of this unit students will have a basic knowledge of the hardware components available in a microcomputer system and a detailed knowledge of facilities and capabilities typically present in a professional real time operating system. The student will have the competence to design, implement and debug interrupt-driven / event driven multitasking systems. The outcomes of this subject are: to be able to design, plan and implement a large real time software system.; to understand the complexity of real time programming; to be able to select appropriate software/hardware platforms for a given control/monitoring task; to understand the problematic of real time software design; to be able to select appropriate software design tool for a real time task: to be able to debug a complete real time system; to be able to organize and distribute tasks in a large software project; to be able to monitor and control the progress towards a due day working in a group; to understand the main facilities offered by professional real time operating system: Processes, Threads, Timers, interrupts, interprocess communications; to be able to present / demonstrate a real time system in time; to be able to report results in a professional manner.

Textbooks

Auslander DM & Tham CH, Real Time Software for Control, Prentice Hall, 1990. Library Classification: 629.8102, 629.8955133.

MECH4902

Orthopaedic and Surgical Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of Lectures per week **Prerequisites:** AMME2301, AMME2302, ENGG1802, BIOL1003, MECH2901, MECH3921. **Assumed knowledge:** Basic concepts in engineering mechanics-statics, dynamics, and solid mechanics; Basic concepts in materials science, specifically with regard to types of materials and the relation between properties and microstructure; and A basic understanding of human biology and anatomy. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The aims and objectives of the UoS are:

1.To introduce the student to the details and practice of orthopaedic engineering.

2.To give students an overview of the diverse knowledge necessary for the design and evaluation of implants used in orthopaedic surgery.

3.To enable students to learn the language and concepts necessary for interaction with orthopaedic surgeons and the orthopaedic implant industry.

4.To introduce the student to the details and practice of other engineering applications in surgery, particularly in the cardiovascular realm.

MECH4961

Biomechanics and Biomaterials

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures per week **Prerequisites:** AMME2302; MECH2900 or MECH2901 **Prohibitions:** MECH4960 **Assumed knowledge:** MECH3300 or MECH3362 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This course is divided into two parts: biomaterials and biomechanics: Biomaterials This course will involve the study of biomaterials from two perspectives: firstly, the response of the body towards the biomaterial - an immune response and foreign body reaction; secondly, the response of the biomaterial to the body - corrosion, biodegradation, and mechanical failure. Our study will begin with the response of the body towards the biomaterial. We will begin by looking at the immune system itself and then move on to look at the normal inflammatory response. We will then study in detail the foreign body reaction caused by biomaterials. The final part of this section is the study of protein adsorption onto biomaterials, with a strong focus on the Vroman effect. Then we will move onto the response of the biomaterial to the body. We will begin by a review of biomaterials, their applications, and compositions, and mechanical properties. We will then look at key problems such as corrosion, stress shielding, static fatigue, and mechanical failure. Finally, we will take a practical look at the materials themselves. Beginning with ceramics (bioinert, biodegradable, and bioactive), we will then study polymers (thermoplastic, thermosetting, and biodegradable), and finally metals. Biomechanics Biomechanics is the study of the body from the point of view of it being an engineering structure. There are many aspects to this since the human body contains soft tissues, hard tissues (skeletal system), and articulating joints. We will begin with a general introduction to biomechanics, modelling the human body from the macroscopic level to the microscopic level. We will then study soft tissue mechanics, with respect to both non-linear and viscoelastic descriptions, with a significant focus on the mathematical methods used in relation to the mechanics of the system. We will then look at specific aspects of biomechanics: muscle mechanics, joint mechanics, kinematics and dynamics of human gait (gait analysis), biomechanics of cells, physiological fluid flow, biomechanics of injury, functional and mechanical response of tissues to mechanical loading.

MTRX1701

Mechatronics Engineering Introductory

Credit points: 6 **Session:** Semester 1 **Classes:** 1 hour of lectures, 1 hour of tutorials and 3 hour of workshop practice per week **Prohibitions:** AERO1560, MECH1560, ENGG1800 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit of study aims to introduce students to the fundamental principals that underlie the study of Mechatronic Engineering. It lays the foundation for later studies, including advanced Mechatronic Engineering, computing, control and system design courses. The courses also provides students with the opportunity to develop an understanding of a range of machining and manufacturing processes required to make mechanical components.

Introduction to Mechatronic Engineering (3CP):

a) Introduction - and introduction to the course structure of the Mechatronic Engineering Degree

b) Systems Modelling and Control - Fundamental concepts which underlie the modelling and control of dynamic systems

c) Design Process - The process of Design as an important part of the engineering process

d) Actuators - Components that exert effort to accomplish a given task

e) Sensors - Components which take measurements of the environment

f) Computers - Hardware & Software components that, when combined, allow a system to be controlled

g) Advanced Topics - Case studies relating to the application of Mechatronic Engineering principles.

Manufacturing Technology (3 CP): Safety requirements: All students are required to comply with the safety regulations. Students who fail to do this will not be permitted to enter the workshops. In particular, approved industrial footwear must be worn, and long hair must be protected by a hair net. Safety glasses must be worn at all times. Workshop Technology practical work in: (a) Fitting . Measurement, marking, hammers, cutting, tapping and screwing, reaming and scraping. (b)Machining . lathe, mill, grinder, drill, shaper, and finishing operations. (c)Welding . Practical work in gas and electric welding. (d)Blacksmithing and forging. (e) Foundary . moulding and casting.

MTRX1702

Mechatronics 1

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures and 2 hours of labs per week. **Prohibitions:** ELEC1101, ELEC2602, COSC1902, COSC1002 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to provide: an introduction to the analysis and design of digital logic circuits; a foundation for the study of systems and embedded programming for the degree in Mechatronic Engineering.

Course content will include: Introductory Digital Systems 3 CR: Number systems and codes; Logic gates and Boolean algebra, universal (nand) logic gates; Digital arithmetic: operations and circuits, Two's complement addition and subtraction, overflow; Combinational logic

circuits; Flip-flops and related devices; Counters and registers, shift register applications; sequential circuits, designs of synchronous, cascadable counters (BCD and binary). Integrated circuit logic families and interfacing; practical issues including, fan out, pull-up/down, grounds, power supplies and decoupling; timing issues, race conditions. Tri-state signals and buses; MSI logic circuits, multiplexers, demultiplexers, decoders, magnitude comparators; Introduction to programmable logic devices. The unit of study will include a practical component where students design and implement logic circuits. Purchase of a basic laboratory kit as described in classes will be required. Introductory Software Engineering (3 Cr): This unit of study provides an introduction to software design, implementation, debugging and testing in the context of C programming language. Problem definition and decomposition; the design process; designing for testing and defensive coding methods; modular code structure and abstract data types; best practice in programming. Preprocessor, tokens, storage classes and types. Arithmetic, relational and bit manipulation operators. Constructs for control flow: if, switch, for, do and while. Arrays. Pointers and character strings. Dynamic memory. Functions and parameter passing. Derived storage classes: structures and unions. File I/O.

Textbooks
Wakerly, Introduction to Digital Design, 3ed., Prentice-Hall, 2000.
Library Classification: 621.3819, 621.39
Reference Books
Kernighan & Ritchie The C Programming Language 2nd ed (Prentice Hall, 1988)
Deitel & Deitel, C How to Program, 3ed, Prentice-Hall, 2001

MTRX2700
Mechatronics 2

Credit points: 6 **Session:** Semester 1 **Classes:** 1 hour of lectures and 3 hours of laboratory work per week. **Prerequisites:** MTRX1701 and MTRX1702 **Prohibitions:** ELEC2601, ELEC3607 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The aim of the unit is to introduce students to microprocessor and microcomputer systems, emphasizing assembly language programming and building on the digital logic foundations from first year. In particular, the following subjects are addressed: Introduction to microprocessors, stored-program computer architecture, instruction codes and addressing modes, instruction execution cycle; Memory devices. Computer architecture and assembly language programming. Microprocessor and microcontroller systems, memory and IO interfacing, interrupts and interrupt handling. Serial and parallel communications. System design, documentation, implementation, debugging and testing. MTRX2700 is the introductory course in the basics of real Mechatronic systems. This course builds on knowledge obtained in the courses ENGG1801, MTRX1701, ELEC1103 and MTRX1702. This course extends this knowledge by introducing students to their first practical applications in Mechatronic Engineering. By passing this subject, the student will have obtained the necessary skills to undertake Mechatronics 3 (MTRX3700).

MTRX3700
Mechatronics 3

Credit points: 6 **Session:** Semester 2 **Classes:** 2.5 hours of lectures and 3 hours of lab work per week. **Prerequisites:** MTRX2700 **Prohibitions:** MECH4710 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to provide experience, confidence and competence in the design and implementation of microprocessor-based products and instruments; to impart a detailed knowledge of the software and hardware architecture of a typical modern microcontroller, and an understanding of the use of these resources in product design; and to provide experience of working in a project team to prototype a realistic product to meet a specification.

At the end of this unit students will understand microprocessor system organization, and the organization of multiple and distributed processor systems, special purpose architectures (DSPs etc) and their application. The student will have a detailed knowledge of the software and hardware architecture of a modern microcontroller. This knowledge will include an in-depth understanding of the relationship between assembly language, high-level language, and the hardware, of the utilisation and interfacing of microcontroller hardware resources, and of the design and development of software comprised of multiple interrupt-driven processes. The student will have the competence to develop prototype microprocessor-based products.

Course content will include single processor systems, multiple and distributed processing systems, special purpose architectures (DSPs etc) and their application; standard interfacing of sensor and actuation systems; ADC/DAC, SSI, parallel, CAN bus etc.; specific requirements for microprocessor-based products; problem definition and system design; tools for design, development and testing of prototype systems; the unit of study will include a project, where groups of students design, develop and commission a microprocessor-based product.

MTRX4700
Experimental Robotics

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of lab work per week **Prerequisites:** AMME3500; MTRX3700 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to present a broad overview of the technologies associated with industrial and mobile robots. Major topics covered are sensing, mapping, navigation and control of mobile robots and kinematics and control of industrial robots. The subject consists of a series of lectures on robot fundamentals and case studies on practical robot systems. Material covered in lectures is illustrated through experimental laboratory assignments. The objective of the course is to provide students with the essential skills necessary to be able to develop robotic systems for practical applications.

At the end of this unit students will: be familiar with sensor technologies relevant to robotic systems; understand conventions used in robot kinematics and dynamics; understand the dynamics of mobile robotic systems and how they are modeled; have implemented navigation, sensing and control algorithms on a practical robotic system; apply a systematic approach to the design process for robotic systems; understand the practical application of robotic systems in applications such as manufacturing, automobile systems and assembly systems; develop the capacity to think creatively and independently about new design problems; undertake independent research and analysis and to think creatively about engineering problems.

Course content will include: history and philosophy of robotics; hardware components and subsystems; robot kinematics and dynamics; sensors, measurements and perception; robotic architectures, multiple robot systems; localization, navigation and obstacle avoidance, robot planning; robot learning; robot vision and vision processing.

School of Chemical and Biomolecular Engineering

CHNG1103
Material & Energy Transformations Intro

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. **Assumed knowledge:** Mathematics Extension 1; 2 unit Physics; 2 unit Chemistry. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The students should develop an understanding of and competence in the formulation and solution of material and energy balance problems in engineering; develop competence in using basic flowsheet analysis and appropriate computational tools; improve their group work and problem solving skills; gain an ability to extract a simplified version of a problem from a complex situation.

Material Transformation related topics include: unit systems and unit conversions; properties of solids, fluids and gases; mass balance calculations on batch and flow systems; balances on multiple units processes, balances on reactive systems, recycle, bypass and purge calculations; equilibrium compositions of reacting systems; vapour pressure and humidity. Energy transformations include the following topics: apply the first law of thermodynamics to flow and batch systems in process industries; understand thermodynamic properties such as internal energy, enthalpy and heat capacity; conduct energy balances for sensible heat changes, phase transformations and reactive

processes for practical industrial systems; understand the applications of psychrometry, refrigeration, heat of formation and combustion in industry.

CHNG2801
Conservation and Transport Processes

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. 6 hours of laboratory work per semester. **Prerequisites:** All core 1st year engineering units of study. **Assumed knowledge:** Calculus Computations (Matlab, Excel) Mass and Energy Balances **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

By the end of this unit of study, students should be proficient at applying the basic principles of mass, energy and momentum balances to solve engineering problems involving simple fluid flow, heat and mass transfer. Further, students will be able to perform simple dimensional analysis and to see the utility of this general approach in engineering: for example in friction factors, heat and mass-transfer correlations. Students will also develop skills in the basic design of different types of chemical reactors, given the corresponding chemical rate law. The focus of this unit of study is to provide the key concepts and principles as tools through keynote lectures, with supporting tutorials and laboratory sessions giving valuable hands-on experience. Guidance will be provided to students to seek additional detailed information for specific applications in their projects. This unit of study runs concurrently with another enabling technology unit of study CHNG2802. These two units together will provide students with the tools and know-how to tackle the real-life engineering problems encountered in the concurrent project-based unit of study, CHNG2803. This integrated course structure is designed to help students become familiar with the multi-disciplinary nature of chemical engineering today.

CHNG2802
Applied Maths for Chemical Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** All core 1st year engineering units of study. **Corequisites:** CHNG2803 (Analysis Practice 1) CHNG2801 (Conservation and Transport Processes) CHEM2404 (Forensic and Environmental Chemistry) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study consists of two main strands : statistical analysis of data and numerical (computer based) methods for solution of equation sets. By the end of the statistical analysis strand, students should be proficient at applying the basic principles of statistical analysis, and appreciate how they can be applied to a variety of engineering applications. The following statistical tools are studied: normal distribution, the test statistic z, confidence intervals for the population mean, t-distribution, hypothesis testing, data fitting, uncertainty analysis, propagation of random errors and analysis of variance. The numerical methods strand will see students become proficient at: solution of single and multivariable algebraic equations; solution of nonlinear differential equations; use of Excel and Matlab for data manipulation and equation solving; use of commercial flowsheeting software (Hysys) for solving engineering problems. This unit of study runs concurrently with another enabling technology unit of study, CHNG2801. These two units together will provide students with the tools and know-how to tackle the real-life engineering problems encountered in the concurrent project-based unit of study, CHNG2803. This integrated course structure is designed to help students become familiar with the multi-disciplinary nature of chemical engineering today.

CHNG2803
Energy and Fluid Systems Practice

Credit points: 6 **Session:** Semester 1 **Classes:** 8 hours of project work in class per week **Prerequisites:** All core engineering 1st year units of study. **Corequisites:** CHNG2801 (Conservation and Transport Processes) CHNG2802 (Applied Mathematics for Chemical Engineers) CHEM2404 (Forensic and Environmental Chemistry) **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on qualitative and quantitative information. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study is centred around real-life engineering projects which cover traditional and non-traditional domains of chemical engineering, and span the energy, chemical processing and bio-medical sectors.

By the end of this unit, students will be proficient in analysing complex fluid and energy networks and decomposing them into their essential component parts. Students will understand the functionality of each of these key components, and will be able to characterise the performance of the engineering network in terms of both component and system-wide variables. Students will also be able to take this information and explore the optimum operating conditions for the network.

This unit of study runs concurrently with two enabling technology units of study, CHNG2801 and CHNG2802. These two units will provide students with the tools and know-how to tackle the real-life engineering problems encountered in CHNG2803. This integrated course structure is designed to help students become familiar with the multi-disciplinary nature of chemical engineering today.

CHNG2804
Chemical & Biological Systems Behaviour

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** All core 1st year engineering units of study. **Corequisites:** CHNG2805 (Industrial Systems and Sustainability) CHNG2806 (Analysis Practice 2 - Treatment, Purification and Recovery Systems) CHEM2403 (Chemistry of Biological Molecules) **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This is a core unit within the curriculum. Chemical Engineering requires an understanding of material and energy transformations and how these are driven by molecular interactions. The rate of such transformations is dependent on driving forces and resistances, and these need to be defined in terms of fundamental physical and chemical properties of systems. This course seeks to provide students with a sound basis of the thermodynamics of chemical and biological systems, and how these, in turn, define limits of behaviour for such real systems. The thermodynamic basis for rate processes is explored, and the role of energy transfer processes in these highlighted, along with criteria for equilibrium and stability. Emphasis is placed on the prediction of physical properties of chemical and biological systems in terms of state variables. The course delivery mechanism is problem-based, and examples from thermal, chemical and biological processes will be considered, covering molecular to macro-systems scale. The course builds naturally from the second year first semester course in conservation and transport processes, and prepares students fundamentally for the third year course in design of chemical and biological processes, which deals fundamentally with reaction/separation systems, and considers phase and chemical equilibria.

CHNG2805
Industrial Systems and Sustainability

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** All core 1st year engineering units of study. **Corequisites:** CHNG2804 (Chemical and Biological Systems Behaviour) CHNG2806 (Analysis Practice 2 - Treatment, Purification & Recovery Systems) CHEM2403 (Chemistry of Biological Molecules) **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This course involves the study of the various concepts which underpin sustainable development, including technical and economic efficiency, stewardship of the bio-physical environment, and social acceptability. The course examines the material economy from the perspective of open and closed thermodynamic systems, and the implications of this for resource consumption and waste generation. A number of governing sustainability frameworks are examined to determine their suitability within the context of chemical engineering. A range of approaches and tools for determining industries environmental performance are introduced as part of a sustainability framework. Process design and operation, product design are all investigated from a sustainability perspective. Green Engineering principles are highlighted as a potential method for transforming industry.

CHNG2806
Materials Purification and Recovery

Credit points: 6 **Session:** Semester 2 **Classes:** Project work - own time. **Prerequisites:** All core 1st year engineering units of study. **Corequisites:** CHNG2804 (Chemical and Biological Systems Behaviour) CHNG2805 (Industrial Systems and Sustainability) CHEM2403 (Chemistry of Biological Molecules) **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative and quantitative information **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To recognise that chemical engineers are involved in creation of products and processes, in manipulating complex systems, and in managing technical operations. To develop an appreciation of the practical application of concepts and tools to real design problems in the process, products and service sectors in which chemical engineers are engaged. To consider this through three project-driven case studies covering a range of integrated analysis scenarios, from the domain of energy and fluid systems. This course is a concurrent requirement for the concept and enabling technology courses running in parallel in the same semester.

CHNG3041
Exchange Program 3A

Credit points: 24 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Completion of all Year 1 and 2 core units of study in Chemical Engineering, and at least 96 credit points towards the degree. Approval of the Head of School and approval from the host institution is required.

Objectives/Outcomes: The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program. Upon completion of the full year-long exchange (i.e. both CHNG3041 and CHNG3042), students will have completed work at least equivalent to Year 3 in the Chemical Engineering degree, including in particular all Year 3 core units of study.

CHNG3042
Exchange Program 3B

Credit points: 24 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Completion of all Year 1 and 2 core units of study in Chemical Engineering, and at least 96 credit points towards the degree. Approval of the Head of School and approval from the host institution is required.

Objectives/Outcomes: The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program. Upon completion of the full year-long exchange (i.e. both CHNG3041 and CHNG3042), students will have completed work at least equivalent to Year 3 in the Chemical Engineering degree, including in particular all Year 3 core units of study.

CHNG3801
Process Design

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **Corequisites:** CHNG3803, CHNG3802 **Assumed knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in second year have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study consists of three strands: reaction engineering; vapour-liquid equilibrium and distillation; heat transfer. The central aim is to show how these unit operations interact in the design and operation of process equipment. The reaction engineering strand covers the following: development of appropriate kinetic rate laws; use of rate laws in designing continuous stirred tank, plug-flow and packed-bed reactors. The second strand focuses on the following: numerical methods for predicting vapour-liquid equilibrium; binary and multi-component distillation; deviations from ideal behaviour. The heat transfer strand covers the following issues: forced and natural convective heat transfer; shell and tube heat exchangers; heat transfer with phase change; radiative heat transfer. The various strands make extensive use of computer software: Excel and Matlab for data manipulation and equation solving; commercial flowsheeting software (Hysys) for solving engineering design problems. This unit of study runs concurrently with another enabling technology unit of study CHNG3802. These two units together provide students with the tools and know-how to tackle real-life engineering problems encountered in the concurrent project-based unit of study, CHNG3803. This integrated course structure is designed to help students become familiar with the multi-disciplinary nature of chemical engineering today.

CHNG3802
Operating/Improving Industrial Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **Corequisites:** CHNG3801 (Process Design) CHNG3803 (Design Practice 1 - Chemical & Biological Processes) **Assumed knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in second year have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives: All industrial processes require some process monitoring and control for satisfactory operation. The performance of a process may be improved via the implementation of some level of optimisation. This unit of study commences with a component on process data management before moving on to empirical modelling and data reconciliation techniques. The second component will concentrate on the role of process control covering: the development of linear models, control system analysis, the design and performance of feedback control systems, advanced control systems and the use of control related software. The final component will focus on process optimisation of batch and continuous processes. This UoS demonstrates that: process control and optimisation are integral concepts for any modern plant; a unified approach allows a diversity of application fields to be readily handled via a consistent approach from data analysis, though process control to process optimisation. The UoS will allow each student to achieve and demonstrate competency through a range of individual and group-based activities. By the end of this UoS a student should achieve competence in the following: process data management skills relevant to engineering (statistical analysis, data-based modelling and data reconciliation techniques); appreciation of the role of process control in modern manufacturing; designing an appropriate feedback control system and analysing its performance for a range of process applications using both traditional and software-based techniques; appreciation of the limitations of feedback control and be able to design a range of common enhancements; appreciation of the role of process optimisation in modern manufacturing; use of both traditional and software-based techniques to design optimisation schemes for a range of process applications and analyse the performance of such schemes; appreciate the limitations that exist whenever mathematical models

are used as the basis for process control and/or optimisation; appreciate the 'vertical integration' that exists from modelling, through control, to optimisation. This UoS is part of an integrated third-year program in chemical engineering. Completion of this body of work is required before a student will be permitted to move into the final-year with its emphasis on detailed design work, thesis based research and advanced engineering options.

CHNG3803
Chemical/Biological Process Design

Credit points: 6 **Session:** Semester 1 **Classes:** 4 hours of project work in class per week. **Prerequisites:** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **Corequisites:** CHNG3801 (Process Design) CHNG3802 (Operation, Analysis and Improvement of Industrial Systems) **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on qualitative and quantitative information. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives: All industrial processes require some process monitoring and control for satisfactory operation. The efficient use and recovery of energy is vital for industrial processes. The performance of a process may be improved via the implementation of some level of optimisation. This unit of study commences with a component on process data management before moving on to empirical modelling and data reconciliation techniques. The second component will concentrate on the role of process control covering: the development of linear models, control system analysis, the design and performance of feedback control systems, advanced control systems and the use of control related software. In parallel, this unit of study also focuses on the efficient use of energy in process plants. The final component will focus on process optimisation of batch and continuous processes. This unit of study demonstrates that: process control and optimisation are integral concepts for any modern plant; a unified approach allows a diversity of application fields to be readily handled via a consistent approach from data analysis, though process control to process optimisation. The unit of study will allow each student to achieve and demonstrate competency through a range of individual and group-based activities. By the end of this unit of study a student should achieve competence in the following: process data management skills relevant to engineering (statistical analysis, data-based modelling and data reconciliation techniques); appreciation of the role of process control in modern manufacturing; designing an appropriate feedback control system and analysing its performance for a range of process applications using both traditional and software-based techniques; appreciation of the limitations of feedback control and be able to design a range of common enhancements; appreciation of the role of process optimisation in modern manufacturing; use of both traditional and software-based techniques to design optimisation schemes for a range of process applications and analyse the performance of such schemes; appreciate the limitations that exist whenever mathematical models are used as the basis for process control and/or optimisation; appreciate the "vertical integration" that exists from modelling, through control, to optimisation.

CHNG3804
Biochemical Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of project work in class per week. 12 hours of laboratory work per semester. **Prerequisites:** CHNG2801; CHNG2802, CHNG2803; CHNG2804; CHNG2805; CHNG2806; **Assumed knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering units of study in second year have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Biochemical engineering is increasingly playing an important role in technology to modern society. The engineers with knowledge of various aspects of biochemical processes are tremendously valuable. The course will examine cutting edge examples of biochemical technologies across a broad range of applications relevant to chemical engineering. The specific objectives of this course are to understand the history and scope of the biotechnology industry; examine the role of biochemical engineering in the industrial application of biotechnology and its development. We will provide an understanding of the major fundamental aspects of biochemical engineering and implementing the knowledge acquired to some selected industrial applications.

At the completion of this unit of study students should have developed an appreciation of the underlying principles of biochemical engineering and the ability to apply these skills to new and novel situations. The students will be able to critically analyse different types of biochemical engineering processes and to improve these processes consistent with the principles of biochemical engineering.

Students are encouraged to engage in an interactive environment for exchange of information and develop problem-solving skills for successfully handling challenging engineering situations. This course will be assessed by quizzes, assignments and exams.

CHNG3805
Product Formulation and Design

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures : 2 hours per week; Tutorials : 1 hour per week **Prerequisites:** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **Corequisites:** CHNG3806 (Management of Industrial Systems) CHNG3807 (Design Practice 2 - Products and Value Chains) **Assumed knowledge:** Mass and Energy Balances Conservation and Transport Phenomena Applied Mathematics (for Chemical Engineering) Process Design Concepts Process Control and Optimisation Concepts **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Product design is one of the new frontiers of chemical and biomolecular engineering. Many products emerge from their processing not as a continuous stream, but as discrete entities. There are many examples of discrete systems in chemical and biomolecular engineering; these include particulate systems (e.g. powders or solid particles in fluids), as well as polymeric and biological systems (e.g. emulsions and cells, respectively). This unit of study is an introduction to the basic concepts in discrete systems necessary for a chemical engineer to be able to formulate and design discrete products with desired properties. In essence it is a course on product formulation and design.

The unit of study will provide students with a working knowledge of the types of discrete systems available, the ways in which particulate systems can be characterized and their applications in industry. These aspects will form the foundation for an introduction to the common techniques used to model discrete systems. By the end of the unit of study students should be proficient at understanding the types of discrete systems available, and the techniques used to characterise particulate systems, understanding the basic principles of particle-fluid systems, applying these principles and solving simple problems in product design and particulate engineering.

CHNG3806
Management of Industrial Systems

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures/tutorials per week **Prerequisites:** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **Corequisites:** CHNG3805 (Product Formulation and Design) CHNG3807 (Design Practice 2 - Products and Value Chains) **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives: To develop an appreciation of management practice in process-led and product-driven industries; considering project management, economic evaluation of processes, risk assessment and decision making with multiple objectives and uncertainty; to develop the requisite tools to support above; to consider approaches to innovation and entrepreneurship; to consider all this in the context of different scales of operation - from single process,

to business unit, to enterprise, and across supply and value chains; to support this analysis through real-problem case studies and projects.

By the end of this unit of study a student should be competent in: developing project work plans in conjunction with project management schedules; performing economic evaluations of projects, plans and processes; performing qualitative risk assessments of projects, plans and processes; exploring optimisation of complex processes under risk and uncertainty, covering unit operations, business units, enterprises and value chains.

CHNG3807
Products and Value Chains

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures : 1 hour per week; Project Work in class : 6 hours per week **Prerequisites:** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **Corequisites:** CHNG3805 (Product Formulation and Design) CHNG3806 (Management of Industrial Systems) **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on qualitative and quantitative information. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study is designed to give students experience at solving complex, interesting, real world engineering problems, by applying theoretical and experimental principles learnt during their studies. During the unit of study students will be required to work on three project-driven case studies covering a range of design scenarios, from the domain of particulate products, entrepreneurial ventures (business 'start ups'), ethics and product value chains. This unit of study is a concurrent requirement for the concept and enabling technology courses running in parallel in the same semester. By the end of the unit of study students should be proficient at developing a strategy for taking a product development idea from concept to commercial artefact - with a comprehensive appreciation of economic arguments, underlying uncertainties (and how to mitigate these), and consideration of trade-offs inherent in this development. They should also be able to apply design and analysis tools for the synthesis of particulate products leading to the manufacture of a preferred product at pilot scale and be able to develop a strategy for the design and analysis of extended business enterprises. A key aspect of the unit of study is that students demonstrate these outcomes in project mode. The three projects in the unit of study address "issues of scale" of chemical and biomolecular engineering, from molecular to macro-systems levels.

CHNG3808
Polymer Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** CHNG2801; CHNG2802; CHNG2803; CHNG2804; CHNG2805; CHNG2806 **Corequisites:** CHNG3801 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Polymers are ubiquitous and a significant number of scientists and engineers are employed by the Polymer Industry. This unit of study will facilitate engagement with a broad spectrum of engineering knowledge base that range from polymer synthesis to design of polymer products to developing sustainable technology in polymer synthesis and applications. The industrial applications range from biomedical to electronics and semiconductors to nanotechnology, in addition to usual consumer products. Technical knowledge relating to polymer chemistry, mathematics, fluid and solid mechanics, heat transfer, mass transfer and reaction engineering will be applied for the planned outcomes of this course.

The specific objectives are: To analyse molecular structures and their relations with material properties; To investigate the variety of thermal and thermo-mechanical properties relevant for probing polymer structure as well as understanding material behaviour in the context of applications; To engage with rheological characterization of polymers to probe polymer structural as well as to understand material behaviour in the context of applications; To understand the principles of polymer synthesis and to design polymerization reactors for producing polymer resins; To understand the principles of polymer processing in order to design polymeric products for consumer and specialty applications; To critically analyze production of polymeric goods from the sustainability point of view; To engage with examples of cutting-edge engineering product and process designs and applications that encompass biomedical, nanotechnology, electronics and other emerging technologies.

At the completion of this Unit of Study students should have developed: An appreciation of the underlying principles of polymer engineering; The ability to apply these skills to new and novel situations; The ability to critically analyse the methods of manufacture of different products and processes and to improve these processes; The development of an integrated suite of problem-solving skills needed to successfully handle new engineering applications; An ability to independently research and be critical of the findings; An ability to analyze experimental data; An ability to carry out process and product design through critical thinking; Interpersonal, group and teamwork skills including the ability to communicate clearly and concisely; Professionalism in terms of taking responsibility for the results of their calculations and recommendations; Lifetime or self-directed learning skills including the ability to critically assess one's own performance in a constructive manner.

CHNG4001
Practical Experience

Session: Semester 1, Semester 2 **Classes:** no formal classes **Assumed knowledge:** Advisory prerequisite: 28 credit points of 3rd year units **Campus:** Camperdown/Darlington **Mode of delivery:** Professional Practice

Students are to obtain first-hand experience of the way chemical engineering skills are employed in an industrial context. Each student is required to work as an employee of an approved organisation and to submit a report on that work. The employment undertaken must be relevant to Chemical Engineering and should be discussed, before acceptance, with a member of the Department of Chemical Engineering. While the responsibility for obtaining satisfactory employment rests with the student, the Department, through the Chemical Engineering Foundation, and the Careers and Appointments Service will assist wherever possible.

CHNG4008
Chemical Engineering Advanced Concepts

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** no formal classes **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Project based unit which allows students to work in conjunction with a research groups or industry specialists in Chemical and Biomolecular Engineering to experience modern developments in the field.

CHNG4041
Exchange Program 4A

Credit points: 24 **Session:** Semester 1, Semester 2 **Prerequisites:** Completion of all Year 1, 2 and 3 core units of study in Chemical Engineering, and at least 144 credit points towards the degree. Approval of the Heads of School of Chemical and Biomolecular Engineering at the University of Sydney and at the participating exchange institution. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Year 4 elective unit of study for the degree in Chemical Engineering. Objectives/Outcomes: The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program. Upon completion of the full year-long exchange (i.e. both CHNG4041 and CHNG4042), students will have completed work at least equivalent to Year 4 in the Chemical Engineering degree, including in particular the Year 4 core units of study, and will have fulfilled all the requirements of their degree from the University of Sydney.

CHNG4042
Exchange Program 4B

Credit points: 24 **Session:** Semester 1, Semester 2 **Prerequisites:** Completion of all Year 1, 2 and 3 core units of study in Chemical Engineering, and at least 144 credit points towards the degree. Approval of the Heads of School of Chemical and Biomolecular Engineering at the University of Sydney and at the participating exchange institution. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Year 4 elective unit of study for the degree in Chemical Engineering. Objectives/Outcomes: The objective of this (single semester) Exchange Program is to provide students with the opportunity to live and learn in a foreign culture while completing the academic and professional requirements of the University of Sydney degree program. Upon completion of the full year-long exchange (i.e. both CHNG4041 and CHNG4042), students will have completed work at least equivalent to Year 4 in the Chemical Engineering degree, including in particular the Year 4 core units of study, and will have fulfilled all the requirements of their degree from the University of Sydney.

CHNG4203
Major Industrial Project

Credit points: 24 **Session:** Semester 1 **Classes:** no formal classes **Prerequisites:** Passed at least 144 credit points and have a WAM greater than credit average Students wishing to do this unit of study are required to discuss the matter with the Head of School prior to enrolment. **Campus:** Camperdown/Darlington **Mode of delivery:** Professional Practice

Note: Department permission required for enrolment.

This unit of study will give students a rich experience in carrying out a major project within an industrial environment, and in preparing and presenting detailed technical reports (both oral and written) on their work.

The project is carried out under joint University/industry supervision and extends over several months, with the student essentially being engaged fulltime on the project at the industrial site. Previous students have been placed with industries in areas including the mining industry, oil and gas processing, plastic and paint manufacture, food production, manufacturing and so on. Students will learn from this experience the following essential engineering skills : how to examine published and experimental data, set objectives, organise a program of work, and analyse results and evaluate these in relation to existing knowledge. Presentation skills will also be developed, which are highly relevant to many branches of engineering activity.

CHNG4802
Chemical Engineering Design A

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2hrs per week, Tutorials 2hrs per week, Site Visits. **Prerequisites:** CHNG3801,CHNG3802, CHNG3803, CHNG3805, CHNG3806, CHNG3807 **Assumed knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering unit of study in third year have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives: In the overall design process, chemical engineers must clearly understand the (often complex) interactions and trade-offs that occur between technical, economic, social and environmental considerations. This units of study builds on concepts in each of these areas introduced in previous years but with an emphasis on their successful integration within a comprehensive design activity. This design activity is spread over two unit of study (Chemical Engineering Design A and B) run in first and second semester. The primary aim in the first unit of study is to consider the technical issues -with an emphasis on creating and evaluating a range of alternative options that exist at both the unit operation and complete flowsheet levels. The primary emphasis in the subsequent unit of study is on evaluating how non-technical considerations affect the final process design and its operation.

By the end of both units of study a student should be able to develop a wide range of alternative conceptual designs for a given product specification and market analysis, have an appreciation of how to evaluate process alternatives at the conceptual level with a view to creating a 'short-list' worthy of more detailed technical investigation, be familiar with the use of process flowsheeting software to compare alternative designs , appreciate the fact that technical considerations are only one component in an overall successful design project and be able to clearly present the results from both individual and group work in oral/written formats.

CHNG4806
Chemical Engineering Design B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture, Project Work - own time, Project Work - in class, **Prerequisites:** CHNG4802 or CHNG4203 **Assumed knowledge:** Enrolment in this unit of study assumes that all core chemical engineering units of study in third-year have been successfully completed, as well as the related first semester unit of study Chemical Engineering Design A. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment in the following sessions: Semester 1.

In the overall design process, chemical engineers must clearly understand the (often complex) interactions and trade-offs that occur between technical, economic, social and environmental considerations. This UoS builds on concepts in each of these areas introduced in previous years but with an emphasis on their successful integration within a comprehensive design activity.

This design activity is spread over two UoS (Chemical Engineering Design A and B) run in first and second semester. The primary aim in the first UoS is to consider the technical issues with an emphasis on creating and evaluating a range of alternative options that exist at both the unit operation and complete flowsheet levels. The primary emphasis in this UoS is on evaluating how non-technical considerations affect the final process design and its operation.

Students joining this course from the Major Industrial Placement Project (MIPPs CHNG4203) or as overseas students (with approval) do the same assignments but on a different schedule.

CHNG4811
Honours Thesis A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** no formal classes **Prerequisites:** CHNG3801, CHNG3802, CHNG3803, CHNG3805, CHNG3806, CHNG3807. This unit is available to only those students who have gained an entry to the Honours degree. **Corequisites:** CHNG4812 **Prohibitions:** CHNG4801, CHNG4813 **Assumed knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.

The ability to plan, systematically conduct and report on a major research project is an important skill for professional engineers. This unit of study builds on technical competencies introduced in previous years, as well as making use of the report writing and communications skills the students have developed. The research activity is spread over two units (Chemical Engineering Thesis A and B) run in first and second semester. In this unit of study, students are required to plan and begin work on a major research project, which is very often some aspect of a staff member's research interests. Some of the projects will be experimental in nature, while others may involve computer-based simulation, design or literature surveys. In this unit, students will learn how to examine published and experimental data, set objectives, organize a program of work and devise an experimental or developmental program. The progress at the end of Thesis A will be evaluated based on a seminar presentation and a progress report. The skills acquired will be invaluable to students undertaking engineering work.

CHNG4812
Honours Thesis B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** no formal classes **Corequisites:** CHNG4811 **Prohibitions:** CHNG4805, CHNG4814 **Assumed knowledge:** Enrolment in this unit of study assumes that Honours Thesis A and all (six) core chemical engineering units of study in third year have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.

The ability to plan, systematically conduct and report on a major research project is an important skill for professional engineers. This unit of study builds on technical competencies introduced in previous years, as well as making use of the report writing and communications skills the students have developed. The research activity is spread over two units (Honours Thesis A and B) run in first and second semester. In this unit of study, the primary emphasis is on the execution of a comprehensive and systemic series of investigations, and the reporting of the study in a major thesis document and an oral presentation. Students will acquire skills in developing a plan for a series of studies to illuminate an area of research, in evaluating alternatives at the conceptual level with a view to creating a 'short-list' worthy of more detailed technical investigation, and in searching the literature for guidance of the studies. Further, communication skills will be developed, such as the ability to clearly present the background and results in a written format and in an oral presentation to a general engineering audience. This UoS is part of an integrated (two semester) fourth year program involving a chemical engineering research project and thesis. It has the overarching aim of completing the 'vertical integration' of knowledge - one of the pillars on which this degree program is based. Students who have successfully completed CHNG4203 Major Industrial Project may apply for exemption from this unit of study and replace it with an advanced level chemical engineering elective unit of study.

CHNG4813
Engineering Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** no formal classes **Prerequisites:** CHNG3801, CHNG3802, CHNG3803, CHNG3805, CHNG3806, CHNG3807 **Corequisites:** CHNG4814 **Prohibitions:** CHNG4805, CHNG4811 **Assumed knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment in the following sessions: Semester 2.
Note: Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.

The ability to plan, systematically conduct and report on a major research project is an important skill for professional engineers. This unit of study builds on technical competencies introduced in previous years, as well as making use of the report writing and communications skills the students have developed. The research activity is spread over two units (Chemical Engineering Thesis A and B) run in first and second semester. In this unit of study, students are required to plan and begin work on a major research project, which is very often some aspect of a staff member's research interests. Some of the projects will be experimental in nature, while others may involve computer-based simulation, design or literature surveys. In this unit, students will learn how to examine published and experimental data, set objectives, organize a program of work and devise an experimental or developmental program. The progress at the end of Thesis A will be evaluated based on a seminar presentation and a progress report. The skills acquired will be invaluable to students undertaking engineering work.

CHNG4814
Engineering Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** no formal classes **Corequisites:** CHNG4813 **Prohibitions:** CHNG4805, CHNG4812 **Assumed knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment in the following sessions: Semester 1.
Note: Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.

The ability to plan, systematically conduct and report on a major research project is an important skill for professional engineers. This unit of study builds on technical competencies introduced in previous years, as well as making use of the report writing and communications skills the students have developed. The research activity is spread over two units (Chemical Engineering Thesis A and B) run in first and second semester. In this unit of study, the primary emphasis is on the execution of a comprehensive and systemic series of investigations, and the reporting of the study in a major thesis document and an oral presentation. Students will acquire skills in developing a plan for a series of studies to illuminate an area of research, in evaluating alternatives at the conceptual level with a view to creating a 'short-list' worthy of more detailed technical investigation, and in searching the literature for guidance of the studies. Further, communication skills will be developed, such as the ability to clearly present the background and results in a written format and in an oral presentation to a general engineering audience.

School of Civil Engineering

CIVL0011
Civil Exchange A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** A workload one quarter of that a full time student at the exchange university. Meet requirements of the exchange course. **Prerequisites:** Departmental permission required, Students must have a WAM >65 and to have completed one full year of study, that is 48 credit points **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Equivalent syllabus of Civil Engineering unit of study/studies unterkaen at exchange university. To be approved by exchange program coordinator.

CIVL0012
Civil Exchange B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** A workload one quarter of that a full time student at the exchange university. Meet requirements of the exchange course. **Prerequisites:** Department permission required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Student must have WAM > 65 and to have completed one full year of study, that is 48 credit points.

Equivalent syllabus of Civil Engineering unit of study/studies unterkaen at exchange university. To be approved by exchange program coordinator.

CIVL0013
Civil Exchange C

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** A workload one quarter of that a full time student at the exchange university. Meet requirements of the exchange course. **Prerequisites:** Department permission required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Student must have WAM > 65 and to have completed one full year of study, that is 48 credit points.

Equivalent syllabus of Civil Engineering unit of study/studies unterkaen at exchange university. To be approved by exchange program coordinator.

CIVL0014
Civil Exchange D

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** A workload one quarter of that a full time student at the exchange university. Meet requirements of the exchange course. **Prerequisites:** Department permission required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Student must have WAM > 65 and to have completed one full year of study, that is 48 credit points.

Equivalent syllabus of Civil Engineering unit of study/studies unterkaen at exchange university. To be approved by exchange program coordinator.

CIVL0015
Civil Exchange E

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** A workload one quarter of that a full time student at the exchange university. Meet requirements of the exchange course. **Prerequisites:** Department permission required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Student must have WAM > 65 and to have completed one full year of study, that is 48 credit points.

Equivalent syllabus of Civil Engineering unit of study/studies unterkaen at exchange university. To be approved by exchange program coordinator.

CIVL0016
Civil Exchange F

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** A workload one quarter of that a full time student at the exchange university. Meet requirements of the exchange course. **Prerequisites:** Department permission required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Student must have WAM > 65 and to have completed one full year of study, that is 48 credit points.

Equivalent syllabus of Civil Engineering unit of study/studies unterkaen at exchange university. To be approved by exchange program coordinator.

CIVL0017
Civil Exchange G

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** A work load one quarter of that of a full time student at the exchange university. Meet requirements of the exchange course. **Prerequisites:** Department permission required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Student must have WAM > 65 and to have completed one full year of study, that is 48 credit points.

Equivalent syllabus of Civil Engineering unit of study/studies unterkaen at exchange university. To be approved by exchange program coordinator.

CIVL0018
Civil Exchange H

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** A work load one quarter of that of a full time student at the exchange university. Meet requirements of the exchange course. **Prerequisites:** Department permission required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Student must have WAM > 65 and to have completed one full year of study, that is 48 credit points.

Equivalent syllabus of Civil Engineering unit of study/studies unterkaen at exchange university. To be approved by exchange program coordinator.

CIVL2110
Materials

Credit points: 6 **Session:** Semester 1 **Classes:** 4 hrs of lectures and a 2 hr tutorial per week & 4 hrs of lab work per semester **Prohibitions:** AMME2302 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Materials are an important part of the civil engineers' work. Indeed, civil engineers who are concerned with the design, construction, and maintenance of facilities need to understand the behaviour and performance of the materials used. And as it happens, mechanical properties - which are essential and basic for civil engineers - are highly dependent on the structure of materials at various scales. Therefore, it is important that a student in Civil Engineering possesses a fundamental knowledge in materials science. This unit of study aims to provide students with the tools necessary to select the adequate material for a particular application and to assess its mechanical behaviour while in use. This course will focus mainly on materials for civil engineering and construction applications, i.e. metals, concrete and soils.

CIVL2201
Structural Mechanics

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week, 2 hours of laboratory per semester. **Prerequisites:** ENGG1802 Engineering Mechanics **Prohibitions:** AMME2301 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The primary objective of this unit is to understand internal actions (forces and moments) in structures (deformable objects) under loads in three key areas: how structures resist external loads by internal actions; the distribution of internal actions within structures; and the deformations, stresses and strains associated with the internal actions.

At the end of this unit, students should be able to understand the basic methods of load transfer in structures - tension, compression, bending, shear and torsion (internal actions); apply the equations of equilibrium to determine the distribution of internal actions in a simple structure by drawing BMDs, SFDs, AFDs, and TMDs; understand the significance and methods of calculation of the geometric properties of structural sections (I, Z, S, J etc); understand the effect of internal forces and deformations of bodies through the concept and calculation of strains and stresses; appreciate the behaviour of structures by analysing structures without numerical calculations; display a knowledge of basic material properties, combined stresses and failure criteria; and demonstrate their hands-on experience of the behaviour of structural members via experiments and the ability to prepare written reports on those experiments.

Emphasis in the assessment scheme will be placed on understanding structural behaviour and solving problems, rather than remembering formulae or performing complex calculations.

The course seeks to utilise and improve the generic skills of students, in areas such as problem solving, neat and logical setting out of solutions, report writing, and team work.

The syllabus comprises introduction; equilibrium; internal actions: BMDs, SFDs, AFDs, and TMDs; elasticity, stress and strain, and basic material properties; axial forces: tension and compression; elastic bending of beams; shear force and shear stresses in beams; torsion; deflection of beams; pipes and pressure vessels; trusses; material properties, combined stresses and yield criteria; advanced bending; introduction to buckling and instability.

CIVL2230
Intro to Structural Concepts and Design

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lectures and 2 hours of tutorials per week **Assumed knowledge:** ENGG1802 Engineering Mechanics, CIVL2110 Materials CIVL2201 Structural Mechanics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The primary objective is to develop an understanding of design concepts and an introduction to the design of steel, concrete and composite structures. This involves calculation of loads on structures caused by gravity, wind and earthquake; and analysis and design of basic structural elements

CIVL2410
Soil Mechanics

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 1 hour of tutorial per week, 10 hrs of laboratory work per semester. **Assumed knowledge:** CIVL2201 Structural Mechanics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This course provides an elementary introduction to Geotechnical Engineering, and provides the basic mechanics necessary for the detailed study of Geotechnical Engineering. This course aims to provide an understanding of: the nature of soils as engineering materials; common soil classification schemes; the importance of water in the soil and the effects of water movement; methods of predicting soil settlements, the stress-strain-strength response of soils, and earth pressures.

CIVL2511
Instrumentation and Measurement

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 to 4 hours of tutorial/project work/laboratory per week. Site visit. **Assumed**

knowledge: CIVL2201 Structural Mechanics, ENGG1802 Engineering Mechanics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to introduce students to the philosophy and principles of measurement, and its uses in Civil Engineering practice and research. The instrumentation used in practice, the underlying physical principles and the basic electrical/electronic and signal processing issues. It will introduce students to issues in the planning and construction of experiments. Give experience working in groups and in producing reports.

At the end of this unit, students should gain an understanding of the importance of measurement, of the methods and application of measurement; ability to conduct experiments and interpret measurements. The course will reinforce key concepts in Structural Mechanics, Fluid Mechanics, Soil Mechanics and Surveying.

The syllabus comprises principles of measurement, presentation of data, error analysis, stress and strain, sensor types and technologies wave based techniques and wave analysis, photographic techniques, signal processing, electric circuit theory.

CIVL2611
Introductory Fluid Mechanics

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Assumed knowledge:** MATH1001 Differential Calculus, ENGG1802 Engineering Mechanics, CIVL2201 Structural Mechanics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objective of this unit of study is to develop an understanding of basic fluid concepts for inviscid and incompressible fluids. Topics to be covered will include: basic fluid properties, hydrostatics, buoyancy, stability, pressure distribution in a fluid with rigid body motion, fluid dynamics, conservation of mass and momentum, dimensional analysis, open channel flow, and pipe flow. This core unit of study together with CIVL3612 forms the basis for further studies in the applied areas of ocean, coastal and wind engineering and other elective fluid mechanics units which may be offered.

CIVL2810
Engineering Construction and Surveying

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and a 2 hour tutorials per week. 18 hrs of practical exercises per semester. **Assumed knowledge:** MATH1001, MATH1002, MATH1003, MATH1005 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to gain an understanding of the fundamentals of engineering construction including systems and methods in construction of excavation, embankments and other earthworks, hauling and associated operations. To provide basic analogue methods of distance, angle and height measurement. To provide an understanding of three dimensional mapping using basic total station electronic field equipment with associated data capture ability. To give an insight into future trends in the use of GPS and GIS systems.

At the end of this unit, students should develop basic competency in earthwork engineering and economic optimisation of related construction, including proposing and analysing systems and methods, estimation of probable output, unit cost and productivity evaluation. Proficiency in the design and implementation of mapping systems in Civil Engineering, using analogue and electronic field equipment and associated software packages.

The syllabus comprises introduction to the framework under which construction projects are formulated and analysed; construction engineering fundamentals; construction systems related to excavation, hauling and embankment construction, including selection and evaluation of plant and methods as well as the expected output and cost; introduction to construction operations management. Introduction to engineering surveying, distance measurement, angle measurement, levelling, traversing, topographic surveys, electronic surveying equipment, future surveying technologies.

CIVL3010
Engineering and Society

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2-3 hours workgroup sessions per week **Assumed knowledge:** ENGG1803 Professional Engineering **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Engineering graduates apply their technical skills in a wide variety of legal, institutional, and environmental settings, acting as agents and managers of technology-driven social change. Engineering decision-making and problem-solving are made more complex by technical, economic, environmental, social and ethical constraints. In particular, environmental sustainability has given rise to a new framework of engineering analysis that is now an essential part of the work of engineers. The goals of this unit are to introduce students to major problems of environmental deterioration, especially air quality, climate change and energy, and to concepts of sustainability and ethics, and show the role of civil engineers in addressing these issues; to develop the students skills at quantifying the impact of engineering decisions within the broader economic, environmental and socio-cultural contexts; to develop communication skills through participation in group discussions, oral presentations, and written report writing. Lectures, group discussions, case problems and projects are all used in teaching and learning in this unit of study. At the end of the unit, students will be able to: a. identify and analyse important ecological, social and ethical issues deriving from technology-driven change, including new paradigms of environmental sustainability, especially in relation to short and long-range air pollution and energy. b. write environmental impact statements for engineering projects and identify and analyse the impacts of infrastructure projects on the social and natural environments. c. use design and analysis tools such as the Life-Cycle Analysis and the BASIX system to develop better engineering design solutions. d. understand the influence of organizational, ethical and legal factors on engineering practice. The secondary objectives of the UoS are: a. to improve students team-work ability. b. to improve students communication skills, through verbal and written media. c. to improve students skills in research and use of library resources. The syllabus comprises rol oh e(s) of civil engineers, historical development of profession, air pollution, climate change, energy; definitions and practice of sustainability; BASIX design system; environmental impact statements; life-cycle analyses; theories of ethical behavior and public interest disclosures.

CIVL3205
Concrete Structures 1

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 3 hours of project work in class per week **Assumed knowledge:** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to provide a basic understanding of the behaviour of reinforced concrete members and structures; to provide a basic understanding of standard methods of analysis and design of reinforced concrete behaviour (including an understanding of capabilities and limitations); and to provide basic design training in a simulated professional engineering environment.

At the end of this unit students will gain proficiency in basic methods of reinforced concrete analysis and design.

The syllabus comprises the behaviour of reinforced concrete members and structures, including: material properties, 'elastic' analysis (stresses/deformations/time-dependence), ultimate strengths of beams (flexure), ultimate strength of columns (short and slender), behaviour or reinforced concrete slabs. The reinforced concrete truss analogy (shear/torsion/and detailing implications). Design of typical elements of a reinforced concrete building, structural modelling, analysis of load-effects (incl.earthquakes), design criteria (for durability, fire-resistance, serviceability and strength), design calculation procedures, reinforcement detailing, structural drawings.

CIVL3206
Steel Structures 1

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures, 3 hours of tutorials per week, 4 hours of laboratory work per semester **Assumed knowledge:** CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study is concerned with the behaviour and design of steel structures. Statics provided the fundamentals of equilibrium upon which most structural engineering is based. Structural Concepts and Structural Analysis provided information on the loads (actions) on a structure and how structures resist these actions with a resulting distribution of internal actions (bending moments, shear forces, axial forces; BMDs, SFDs and AFDs). Structural Mechanics considered how these internal actions resulted in stresses and strains in members. Materials considered the microscopic and molecular structure of metals to determine its inherent mechanical properties such as yield stress. This unit of study will then combine the knowledge of stresses, material properties of steel, structural analysis, and loading, and consider new concepts and modes of failure, such as local and flexural torsional buckling, combined actions and second-order effects to understand the behaviour of steel members and frames, and how this behaviour is accounted for in the design standard AS 4100. Both the units of study Steel Structures 1 and Concrete Structures 1 can be considered the culmination of the various elements of structural engineering begun in Engineering Mechanics in first year, and is further developed in Civil Engineering Design in final year. More advanced topics, such as plate behaviour, advanced buckling and connection design, are considered in the final year elective subject Steel Structures 2. It is recognised that not all students intend to become consulting structural engineers. The unit of study is designed so that students who make an effort to understand the concepts are most capable of passing. Students who are planning a career in the consulting structural engineering profession should be aiming at achieving a Distinction grade or higher.

CIVL3235
Structural Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lectures and 2 hours of tutorials per week **Assumed knowledge:** CIVL2110, CIVL2230 and MATH2061 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to provide an understanding of the principles of structural analysis by introducing the strain-displacement, stress-strain and equilibrium relationships for beam members; applying the relationships to the matrix displacement analysis of frame structures; and using computer software to conduct the linear-elastic and buckling analyses of frame structures.

At the end of this unit, students will be able to deduce appropriate structural models for frame structures; and use computer methods and simple hand methods to obtain internal forces and displacements as well as buckling loads for frame structures.

The syllabus comprises theoretical background (strain-displacement, stress-strain and equilibrium relationships), structural analysis software, matrix displacement method, beam theory, introduction to nonlinear analysis, buckling analysis.

CIVL3411
Geotechnical Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Assumed knowledge:** CIVL2410 Soil Mechanics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to provide an understanding of the factors influencing soil strength, and to give practice in the application of this understanding by exploring the stability of slopes, retaining walls and foundations. At the end of this unit students will be able to: determine the strength parameters appropriate to a range of stability problems, and understand the difference between total and effective stress approaches; evaluate strength parameters from laboratory data; critically analyse foundation stability and slope stability problems; use spreadsheets to perform parametric studies and produce design charts for simple geotechnical design problems; and communicate the results of experiments and analyses using written methods appropriate for professional geotechnical engineers. The syllabus comprises; methods of analysis for gravity and sheet pile retaining walls; reinforced soil; slope stability, including modes of failure, analysis and computer methods; bearing capacity of shallow foundations under general loading, and axial and lateral capacities of deep pile foundations; the mechanical behaviour of sands and clays; the Cam Clay model and the breakage model.

CIVL3612
Fluid Mechanics

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lecture and 2 hours of tutorials per week, 8 hours of laboratory work per semester **Assumed knowledge:** ENGG1802 Engineering Mechanics, MATH2061 - Linear Mathematics and Vector Calculus, CIVL2201 - Structural Mechanics, CIVL2611 - Fluid Mechanics: Inviscid Flow **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to provide an understanding of the conservation of mass and momentum in differential forms for viscous fluid flows. It provides the foundation for advanced study of turbulence, flow around immersed bodies, open channel flow, and turbo-machinery.

CIVL3613
Ocean and Coastal Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lectures and 2 hours of tutorials per week. **Assumed knowledge:** CIVL2611 - Fluid Mechanics: Inviscid Flow **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The objectives of this unit of study are to develop an understanding of the physics of ocean waves at any water depth and its application to the analysis and design of marine structures. This unit of study introduces the governing equations for free surface flows, including linear and nonlinear wave theories, wave transformation physics and nearshore hydrodynamics modelling. Furthermore, this unit of study includes the calculation of wave forces based on deterministic and probabilistic wave theories, wave-induced coastal currents and sediments, wind-wave-structure interactions, tides, ocean engineering operational sea state, storm surges (due to cyclones and tsunamis) and various other environmental effects. Many marine structure design applications are introduced, including jetties, harbours, breakwaters, bridge piers, dams, offshore platforms, turbines and other wind/wave energy devices. The major outcomes of this unit of study are (i) an understanding of wave physics at any water depth and the criteria for choosing the appropriate wave theory, and (ii) the ability to apply this understanding to the analysis and design of engineering marine structures. Although the unit has an analytical focus, the use of model scale, computational techniques and code of practice based design are also discussed.

CIVL3805
Project Scope, Time and Cost Management

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** 36 Intermediate credit points **Assumed knowledge:** CIVL2810 - Engineering Construction and Surveying **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study is a third year core course for the Bachelor of Project Engineering & Management (Civil), fourth year elective for Civil Engineering degree, elective for all other branches of engineering and faculties. The general aim of this unit of study is to offer student the opportunity to develop an understanding of the scope, time and cost management in project environments. Student will engage with some of the key concepts and various activities which underpin project scope, time and cost management. At the end of this unit, students will be able to: develop Work Breakdown Structure (WBS), network diagrams, and undertake Critical Path Analysis (CPA) and Earned Value Analysis (EVA) using the given project information; explain in

depth why scope, time and cost management are important to project management; analyze a project situation that involves scope, time and cost management issues; and explain how the components of scope, time and cost management interrelate in project environments. The syllabus comprises the project planning cycle, working with the project sponsor, scope initiation and definition, project scope definition tools, WBS, network scheduling techniques, CPA, Just-in-Time philosophy, estimating and budgeting, cash flow management, EVA and application of project management software.

CIVL3812
Project Appraisal

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Assumed knowledge:** MATH1005 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS is a third-year core unit for students enrolled in any of the undergraduate streams in the School of Civil Engineering and elective for all other branches of engineering and other faculties. The objectives of this unit of study are to develop students` ability to critically analyse issues involved in project appraisal and to equip students with the concepts, tools and analytical processes to effectively carry out project appraisal tasks for businesses, non-profit organisations, and governments. At the end of this unit, students should be able to comprehend and relate to real-life examples the fundamental concepts in project appraisal (e.g. the meaning of time value for money, equivalence); calculate common financial indicators for a given project and explain the relevance of each to the appraisal of the project; rank projects by combining both financial and non-financial indicators (e.g. environmental and social); understand how risks and uncertainties affect evaluation outcomes and be able to deal with uncertainties and risks in analysis; apply techniques to account for the effects of inflation/deflation and exchange rates in analysis; understand the concept and mechanisms for depreciation and carry out pre-tax as well as post-tax analysis; understand the assumptions, pros and cons of each evaluation method and be able to explain why a particular method is appropriate/not appropriate for a given project. The syllabus comprises time value of money, cost of capital, simple/compound interest, nominal/effective interest, cost/benefit analysis of projects; equivalence, net present worth (value), future worth (value), annual worth (value), internal rate of return, external rate of return, payback period, cost-benefit analysis, cost-utility analysis, identifying and quantifying non-financial benefits/externalities, price changes and exchange rates, techniques for multi-criteria group decision-making, economic analysis of business investment projects, depreciation, capitalisation and valuation studies, replacement of assets, real option, project risk analysis, decision-tree analysis, binomial method, WACC, MARR, equity capital, debt.

CIVL3813
Contracts Formulation and Management

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Prerequisites:** 36 Intermediate (2nd year) credit points **Assumed knowledge:** CIVL3805 Project Scope, Cost & Time Management **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to give students a fundamental knowledge of the legal system and contract terms under which projects are generally conducted. Emphasis will be on the principles of contract formulation, administration and finalisation, including prevention and/or settlement of disputes. At the end of this unit, students will have both legal and practical knowledge in the field of project management and contract administration, within a legal framework. The syllabus comprises brief overview of the legal system in Australia and comparison with other legal systems introduction to project delivery systems and the running of a typical project, introduction to contract law and the formation of contracts, the principles of standard form contracts as well as bespoke drafting, an understanding of the risks undertaken by the different contracting parties, a detailed review of a standard contract promoting an understanding of major project issues such as time, variations and payment; implementation and administration; potential liabilities associated with project participation; contract conditions and specifications; management of claims for variations and extensions of time; notification requirements including time bar, understanding the commercial significance of issues such as latent conditions, subcontracting, bank guarantees and security of payment legislation.

CIVL4022
Honours Thesis A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Weekly contact with supervisor - typically 1 hour per week **Prerequisites:** 30 credit points of Senior Units of Study, ISWAM 65 or over **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Honours Thesis provides an opportunity for students to conduct original research. Students will generally work in groups, although planning and writing of the thesis will be done individually; i.e., a separate thesis must be submitted by each student. Only in exceptional circumstances and by approval of Thesis course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually. Honours Thesis is a major task and is to be conducted with work spread over most of the year, in two successive Units of Study of 6 credits points each, Honours Thesis A (CIVL4022) and Honours Thesis B (CIVL4023). This particular unit of study, which must precede CIVL4023 Honours Thesis B, should cover the first half the work required for a complete 'final year' thesis project. In particular, it should include almost all planning of a research or investigation project, a major proportion of the necessary literature review (unless the entire project is based on a literature review and critical analysis), and a significant proportion of the investigative work required of the project.

CIVL4023
Honours Thesis B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Weekly contact with supervisor - typically 1 hour per week **Prerequisites:** 30 credit points of Senior units of study and successful completion of CIVL4022 - Honours Thesis A **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Honours Thesis provides an opportunity for students to conduct original research. Students will generally work in groups, although planning and writing of the thesis will be done individually; i.e., a separate thesis must be submitted by each student. Only in exceptional circumstances and by approval of Thesis course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually. Honours Thesis is a major task and is to be conducted with work spread over most of the year, in two successive Units of Study of 6 credits points each, Honours Thesis A (CIVL4022) and Honours Thesis B (CIVL4023). This particular unit of study, which must precede CIVL4023 Honours Thesis B, should cover the first half the work required for a complete 'final year' thesis project. In particular, it should include almost all planning of a research or investigation project, a major proportion of the necessary literature review (unless the entire project is based on a literature review and critical analysis), and a significant proportion of the investigative work required of the project.

CIVL4024
Engineering Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Weekly contact with Supervisor - typically 1 hour per week **Prerequisites:** 30 Credit Points of Senior Units of Study **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment in the following sessions: Semester 2.

Engineering Project A & B provide an opportunity for students to undertake a major project in a specialised area relevant to civil engineering. Students will generally work in groups, although planning and writing of reports will be done individually; i.e., a separate report must be submitted by each student. Only in exceptional circumstances and by approval of Engineering Project course coordinator and the

relevant academic supervisor concerned will a student be permitted to undertake a project individually. Engineering Project is spread over a whole year, in two successive Units of Study of 6 credits points each, Engineering Project A (CIVL4024) and Engineering Project B (CIVL4025). This particular unit of study, which must precede CIVL4025 Engineering Project B, should cover the first half of the work required for a complete 'final year' thesis project. In particular, it should include almost all project planning, a major proportion of the necessary background research, and a significant proportion of the investigative or design work required of the project.

CIVL4025
Engineering Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting, Project Work - own time. **Prerequisites:** 30 Credit Points of Senior Units of Study and successful completion of CIVL4024 Engineering Project A **Prohibitions:** CIVL4022, CIVL4023 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment in the following sessions: Semester 1.

Engineering Project A & B provide an opportunity for students to undertake a major project in a specialised area relevant to civil engineering. Students will generally work in groups, although planning and writing of reports will be done individually; i.e., a separate report must be submitted by each student. Only in exceptional circumstances and by approval of Engineering Project course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually. Engineering Project is spread over a whole year, in two successive Units of Study of 6 credits points each, Engineering Project A (CIVL4024) and Engineering Project B (CIVL4025). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL4024 Engineering Project A, should cover the second half of the work required project work. In particular, it should include completion of all components planned but not undertaken or completed in CIVL4024 Engineering Project A.

CIVL4810
Mgmnt of People, Quality and Risk in PE

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Assumed knowledge:** CIVL3805 Project Scope, Time and Cost Management **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study is a fourth year core unit of study for the Bachelor of Project Engineering & Management (Civil), elective for all other branches of engineering and other faculties. The objectives of this unit are to provide underpinning knowledge and application skills in the project environment for quality, risk and people management. At the end of this unit, students will be able to understand the dynamics of team building and management, conflict resolution processes and techniques, project leadership; and, be able to design and implement plans for quality and risk management on a range of simple generic projects and provide input to these plans for more complex projects. The syllabus comprises team management, conflict resolution and project leadership; modern quality management principles and techniques, quality assurance, preparation of quality plans; risk analysis, planning and risk management throughout a project's life cycle.

Textbooks
Harold Kerzner, Project Management - Systems Approach to Planning, Scheduling, and Controlling, 9th Ed. (2006), Johns Wiley: New Jersey.

CIVL4811
Engineering Design and Construction

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures/project work in class per week. **Assumed knowledge:** CIVL2810 Engineering Construction and Survey **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to develop an understanding of construction methods, strategies, equipment and machinery in a range of construction activities and an understanding of the principles involved in the design for those construction activities.

At the end of this unit, students will have developed a familiarity with a variety of construction methods, strategies, equipment and machinery in a range of construction activities such that they will be able, if and when the opportunity arises to participate as site engineers (or similar role) in the planning and execution of those construction activities, albeit with supervision and guidance from experienced professionals. Students will also have developed an understanding of the design principles and techniques involved in the planning for those construction activities such that they are able, if and when the opportunity arises, to participate as design engineers, in the planning and design for those construction activities, with supervision and guidance from experienced professionals. The range of topics covered in this course is such that the learning outcomes form a basis for later development of more detailed knowledge, dependent on the future career experiences of the student. The course does not prepare a student for immediate, unsupervised participation in construction and design work associated with the topics covered.

The construction topics covered in this course have not been previously addressed in CIVL2810 (Engineering Construction and Survey). The topics may vary dependent on current and planned projects in Sydney, NSW and Australia. At this stage the topics are hard rock tunnelling and general hard rock underground excavation; soft ground tunnelling; underground construction; micro tunnelling; cut and cover (cover and cut) tunnelling; earth retaining systems; piling; formwork and falsework (incl Tilt up, Ultrafloor, Sacrificial form); dewatering; pavement design and construction - rigid and flexible (incl and pavement construction materials); stormwater drainage design and construction; marine construction; civil construction in environmentally sensitive areas; contract administration for construction engineers; general engineering in remote localities (project based); construction methods in bridge engineering; QA documentation on a typical project; insurance in the construction industry occupational health and safety issues in the construction industry.

CIVL4814
Project Procurement and Tendering

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Assumed knowledge:** CIVL3805 Project Scope, Time and Cost Management **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study is a fourth year core unit of study for the Bachelor of Project Engineering and Management (Civil), elective for all other branches of engineering and other faculties. The general aim of this unit is to offer student the opportunity to develop an understanding of the procurement of built facilities and the methods of job allocation in project environments. Student will engage with some of the key concepts which underpin job allocations in the construction industry. At the end of this unit of study, students should be able to: evaluate a client's procurement situation and apply an appropriate procurement route; explain how and why a particular procurement route is chosen; undertake procurement assessment exercises; analyze a contractor's strategic responses in tendering (bidding) decision-making; discuss why a particular bidding strategy is chosen in different contexts; and evaluate a contractor's bidding performance using competitor analysis techniques. The syllabus comprises fundamentals of building procurement, assessment of procurement risks, international contracting, competitive bidding, cost estimating, the competitive environment in the construction industry, contractors' competitive positioning, contractors' decision-making in bidding competition, bidding strategies and competitor analysis.

CIVL4815
Project Formulation

Credit points: 6 **Session:** Semester 1 **Classes:** 4 hours of lectures/tutorials per week **Prerequisites:** CIVL3805 Project Scope, Time and Cost Management, CIVL3812 Project Appraisal **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study is a fourth-year core unit for PEM students and an elective for all other branches of engineering and other faculties. The assumed knowledge for this Unit includes Project Appraisal (CIVL3812)

and Project Scope, Time and Cost Management (CIVL3805). The objective of this unit is, through the integration of areas of project management knowledge learned in various PEM subjects, to develop students' ability to develop project proposals through carrying out a feasibility study and developing a project plan for a real-life engineering project. This unit is relevant for students who intend to pursue a career related to project management. At the end of this unit, students should have developed understanding of the fundamentals of project conceptualisation, appraisal and planning plus the abilities to: model and analyse basic financing and cash flow requirements; develop risk management plan, marketing and sales plan, stakeholder management and communication plan, operations plan; and design professional documentation and presentation to a board of review. In addition, this unit also develops students' abilities in problem solving, working with other students, conducting independent research, communication in team environment, information need identification and collection, and understanding social and environmental issues. The syllabus comprises feasibility study, project appraisal, risk assessment and management, sensitivity analysis, project planning, project integration management, carbon-trading scheme, global warming, environmental impact assessment, investment capital, venture capital, due diligence, project planning, operational planning, revenue projection, community consultation, communication management, stakeholder management, political environment.

CIVL4903
Civil Engineering Design

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures and 3 hours of tutorial per week. **Assumed knowledge:** CIVL3205 Concrete Structures 1 and CIVL3206 Steel Structures 1. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This is a fourth year core unit of study for the degree in Civil Engineering and fourth year elective for the degree in Project Engineering and Management (Civil).

The objective of this unit is to give students an appreciation of the role of the designer in the development of Civil Engineering projects.

At the end of this unit, students will have developed an understanding of the design philosophy. They will gain this through their involvement in a number of exercises which cover the design sequence from concept to documentation.

The syllabus comprises: design sequence including definition, value and criteria selection; generation of proposals; analysis of proposals; selection of design; development of details of a particular design selected; feasibility studies and examination of existing works; study of design projects by stages, including details of some aspects.

This unit is under the direction of an engineer in professional practice in cooperation with members of the academic staff. Lectures and exercises on architectural design and practice and their relationship to civil engineering are included in the unit.

Textbooks

Reference books
The unit is of a wide-ranging nature, and all text and reference books previous and current courses have relevance. In addition, reference will be made to many codes and guides to practice, of which the following list covers only the structural field:
Current SAA Codes, Manuals and Specifications, particularly
AS4100 - Steel Structures Code
AS3600 - Concrete Structures Code
AS1554 - Manual Welding, Part I
AS1170 - Loading Code, Parts I and II
AS1511 - High Strength Structural Bolting Code
MAI Steel Structures
Austroads Bridge Design Specification
AS1720 - Timber Engineering Code
(Purchase of separate codes is recommended)

School of Electrical and Information Engineering

ELEC1103
Fundamentals of Elec and Electronic Eng

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures, 2 hours of laboratory, 2 hours tutorial. **Assumed knowledge:** HSC Physics, HSC Mathematics extension 1 or 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to develop knowledge of the fundamental concepts and building blocks of electrical and electronics circuits. This is a foundation unit in circuit theory. Circuit theory is the electrical engineer's fundamental tool.

The concepts learnt in this unit will be made use of heavily in many units of study (in later years) in the areas of electronics, instrumentation, electrical machines, power systems, communication systems, and signal processing.

Topics: a) Basic electrical and electronic circuit concepts: Circuits, circuit elements, circuit laws, node and mesh analysis, circuit theorems, energy storage, capacitors and inductors, circuits with switches, transient response, sine waves and complex analysis, phasors, impedance, ac power.; b) Project management, teamwork, ethics; c) Safety issues

ELEC1601
Foundations of Computer Systems

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures, 1 hour of tutorial, 1 hour project work and 2 hours of laboratory per week. **Assumed knowledge:** HSC Mathematics extension 1 or 2 **Campus:** Camperdown/Darlington **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.

The unit covers the fundamental digital concepts upon which the design and operation of modern digital computers are based. Topics covered include: data representation, basic computer organisation, the CPU, elementary gates and logic, peripheral devices, software organisation, machine language, assembly language, operating systems, data communications and computer networks.

ELEC2004
Electrical Engineering: Foundations

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hour of lectures, 1 hour of tutorial, 1 hour of laboratory and 1 hour of E-Learning per week. **Prohibitions:** ELEC1103, ELEC1601 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

1. Introduction to Electric Circuits: current and voltage, power, Kirchhoff's Laws, sources and resistors, Ohm's Law, series and parallel connections, voltage and current dividers, equivalent circuits. Inductors and capacitors, RC circuits, RL circuits, introduction to RLC circuits.

2. Electric Power Systems: sinusoidal signals, effective (rms) value of sinusoids, power in ac circuits, transformer principles and ideal transformers, balanced 3-phase circuits. Electromechanical machine types, DC machines, introduction to ac and induction machines.

3. Basic Electronics: Op amp, inverting amplifier, noninverting amplifier, basic op-amp circuits. Digital signals and circuits, truth table and basic logic functions, Boolean function, digital circuit design and realisation. Introduction to Sequential digital systems.

ELEC2103
Simulation & Numerical Solutions in Eng

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour lecture, 3 hours of laboratory per week **Prohibitions:** COSC1001, COSC1901 **Assumed knowledge:** ELEC1103 Fundamentals of Electrical and Electronic Engineering, ELEC1601 Foundations of Computer Systems. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit assumes an understanding of the fundamental concepts and building blocks of electrical and electronics circuits. As well as covering the specific topics described in the following paragraphs, it aims to develop skills in professional project management and teamwork and promote an understanding of ethics.

Basic features of Matlab. The Matlab desktop. Interactive use with the command window. Performing arithmetic, using complex numbers and mathematical functions. Writing script and function m-files. Matrix manipulations. Control flow. Two dimensional graphics. Application

of Matlab to simple problems from circuit theory, electronics, signals and systems and control. Investigation of the steady state and transient behaviour of LCR circuits.

Matlab based numerical solutions applicable to numerical optimization, ordinary differential equations, and data fitting. Introduction to symbolic mathematics in Matlab. Applications, including the derivation of network functions for simple problems in circuit analysis. Introduction to the use of Simulink for system modelling and simulation.

ELEC2104
Electronic Devices and Circuits

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures per week, 2 hours of tutorial and 2 hours lab per fortnight. **Prohibitions:** ELEC2401 **Assumed knowledge:** ELEC1102 Foundations of Electronic Circuits or ELEC1103 Professional Electronic Engineering. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The purpose of this unit of study is to provide a working knowledge of fundamental principles of electronic engineering The topics covered include circuit theory and microelectronics. A background in introductory circuit theory is assumed..

The following specific topics are covered. Semiconductor diodes: junction diodes, special purpose diodes. Transistors: field effect and bipolar transistors. Large signal amplifiers: practical amplifiers, differential amplifiers, biasing circuits. Operational amplifiers: circuit applications.

ELEC2302
Signals and Systems

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours lab/tutorial per week, 1 hour of ELearning per week. **Prohibitions:** ELEC2301, MATH3019, MATH3919 **Assumed knowledge:** MATH1001 Differential Calculus and MATH1002 Linear Algebra and MATH1003 Integral Calculus and Modelling. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to teach some of the basic properties of many engineering signals and systems and the necessary mathematical tools that aid in this process. The particular emphasis is on the time and frequency domain modeling of linear time invariant systems. The concepts learnt in this unit will be heavily used in many units of study (in later years) in the areas of communication, control, power systems and signal processing. A basic knowledge of differentiation and integration, differential equations, and linear algebra is assumed.

ELEC2602
Digital System Design

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures per week and 3 hours labs/tutorials per week. **Prohibitions:** ELEC3601, ELEC3608 **Assumed knowledge:** ELEC1103 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The purpose of this unit is to equip the students with the skills to design simple digital logic circuits which comprise modules of larger digital systems. The following topics are covered: logic operations, theorems and Boolean algebra, number operations (binary, hex, integer and floating point), combinational logic analysis and synthesis, sequential logic, registers, counters, bus systems, state machines, simple CAD tools for logic design, and the design of a simple computer.

ELEC3104
Engineering Electromagnetics

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** ELEC3102 **Assumed knowledge:** Differential calculus, integral calculus, vector integral calculus; electrical circuit theory and analysis using lumped elements; fundamental electromagnetic laws and their use in the calculation of static fields. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit introduces students to the broad spectrum of engineering electromagnetics and helps students to develop theoretical and analytical skills in the area of electrical and telecommunications engineering and develop understanding of the basic electromagnetic theory underpinning optical communications, wireless communications and electrical engineering.

ELEC3203
Electricity Networks

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures, 3 hours of lab and 1 hour tutorial per week. **Prohibitions:** ELEC3201 **Assumed knowledge:** This unit of study assumes a competence in first year mathematics (in particular, the ability to work with complex numbers), in elementary circuit theory and in basic electromagnetics. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study provides an introduction to electrical power engineering and lays the groundwork for more specialised units. It assumes a competence in first year mathematics (in particular, the ability to work with complex numbers), in elementary circuit theory and in elements of introductory physics. A revision will be carried out of the use of phasors in steady state ac circuit analysis and of power factor and complex power. The unit comprises an overview of modern electric power system with particular emphasis on generation and transmission. The following specific topics are covered. The use of three phase systems and their analysis under balanced and unbalanced conditions. Transmission lines: calculation of parameters, modelling, analysis. Transformers: construction, equivalent circuits. Generators: construction, modelling for steady state operation. Cables: types and modelling for steady state operation. Types of electricity grids, radial, mesh, networks. The use of per unit system. The analysis of systems with a number of voltage levels. The control of active and reactive power. The load flow problem: bus and impedance matrices, solution methods.

ELEC3204
Power Electronics and Applications

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures, 2 hours tutorial and 3 hours lab per week. **Prerequisites:** ELEC2104 **Prohibitions:** ELEC3202 **Assumed knowledge:** Differential equations, linear algebra, complex variables, analysis of linear circuits. Fourier theory applied to periodic and non-periodic signals. Software such as MATLAB to perform signal analysis and filter design. Familiarity with the use of basic laboratory equipment such as oscilloscope, function generator, power supply, etc. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to teach the fundamentals of advanced energy conversion systems based on power electronics. It provides description of the operation principles and control of these blocks. Through analysis and design methodologies, it delivers an in depth understanding of modern enabling technologies associated with energy conversion. Through laboratory hands-on experience on actual industrial systems, such electrical motor drives, robotic arms, and power supplies, it enhances the link between the theory and the "real" engineering world. The unit clarifies unambiguously the role these imperative technologies play in every human activity; from mobile telephone chargers to energy electricity grids; from electric vehicles and industrial automation to wind energy conversion to name just few. The following topics are covered: Introduction to power electronic converters and systems; applications of power electronic converters; power semiconductor devices; uncontrolled rectifiers: single- and three-phase; non-isolated dc-dc converters: buck, boost and buck-boost; isolated dc-dc converters; inverters: single- and three-phase; uninterruptible power supplies; battery chargers and renewable energy systems; electric and hybrid electric vehicles technologies, design of converters and systems.

ELEC3206
Electrical Energy Conversion Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures per week, 2 hours tutorial per fortnight and 3 hours lab per fortnight. **Prerequisites:** ELEC2104 **Assumed knowledge:** Following concepts are assumed knowledge for this unit of study: familiarity with circuit theory, electronic devices, ac power, capacitors and inductors, and electric circuits such as three-phase circuits and circuits with switches, the use of basic laboratory equipment such as oscilloscope and power supply. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to give students a good understanding of electrical energy conversion techniques and equipment. Students who successfully complete this unit will 1) have a broad view of electrical energy conversion systems including transformers, DC machines, induction machines and synchronous machines; 2) be able to analyze

and solve problems in transformers and electric machines; 3) have gained confidence in their ability to undertake more advanced study in the power area. The following specific topics are covered: magnetic circuits, inductance, sinusoidal excitation, hysteresis and eddy current loss, permanent magnets, electromechanical energy conversion, singly-excited and doubly-excited systems, transformers, single-phase, equivalent circuit parameters, three-phase transformers, autotransformers, DC machines, separate excitation, shunt excitation, series excitation, and compound excitation, efficiency, armature reaction, induction machines, revolving field, equivalent circuit, squirrel cage machines, measurements of the parameters, DC resistance test, no-load test, blocked-rotor test, synchronous machines, field relationships, power-angle relationships, salient pole machines.

ELEC3304
Control

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week and 12 hours laboratory work per semester. **Prerequisites:** MATH2061 and ELEC2302 **Prohibitions:** ELEC3302, AMME3500 **Assumed knowledge:** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit is mainly concerned with the application of feedback control to continuous-time, linear time-invariant systems. It aims to give the students an appreciation of the possibilities in the design of control and automation in a range of application areas. The concepts learnt in this unit will be made use of heavily in many units of study in the areas of communication, control, electronics, and signal processing. The following specific topics are covered: Modelling of physical systems using state space, differential equations, and transfer functions, dynamic response of linear time invariant systems and the role of system poles and zeros on it, simplification of complex systems, stability of feedback systems and their steady state performance, Routh-Hurwitz stability criterion, sketching of root locus and controller design using the root locus, Proportional, integral and derivative control, lead and lag compensators, frequency response techniques, Nyquist stability criterion, gain and phase margins, compensator design in the frequency domain, state space design for single input single-output systems, pole placement state variable feedback control and observer design.

ELEC3305
Digital Signal Processing

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours lab/tutorial per week. **Prerequisites:** ELEC2302 **Prohibitions:** ELEC3303 **Assumed knowledge:** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, continuous linear time-invariant systems and their time and frequency domain representations, Fourier transform, sampling of continuous time signals. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to teach how signals are processed by computers. It describes the key concepts of digital signal processing, including details of various transforms and filter design. Students are expected to implement and test some of these ideas on a digital signal processor (DSP). Completion of the unit will facilitate progression to advanced study in the area and to work in the industrial use of DSP. This unit assumes a basic knowledge of differentiation and integration, differential & difference equations and linear algebra, plus various time and frequency domain representations of continuous time signals and systems.

The following topics are covered. Review of analog and digital signals. Analog to digital and digital to analog conversion. Some useful digital signals. Difference equations and filtering. Impulse and step response of filters. Convolution representation of filters. The Z-transform. Transfer functions and stability. Discrete time Fourier transform (DTFT) and frequency response of filters. Finite impulse response (FIR) filter design: windowing method. Infinite impulse response (IIR) filter design: Butterworth filters, Chebyshev filters, Elliptic filters and impulse invariant design. Discrete Fourier Transform (DFT): windowing effects. Fast Fourier Transform (FFT): decimation in time algorithm. DSP hardware.

ELEC3404
Electronic Circuit Design

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures per week, and a 2 hour tutorial and 3 hours lab per fortnight. **Prohibitions:** ELEC3401 **Assumed knowledge:** A background in basic electronics and circuit theory is assumed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to teach students analysis and design techniques for electronic systems such as signal amplifiers, differential amplifiers and power amplifiers. Completion of this unit will allow progression to advanced studies or to work in electronics and telecommunication engineering. Topics covered are as follows. The BJT as an amplifier. Biasing in BJT amplifier circuits. Small signal operation and models. Single stage BJT amplifiers. BJT internal capacitances and high frequency models. The frequency response of the common-emitter amplifier. BJT current sources and current mirrors. Differential amplifiers. Output stages and power amplifiers:class A, class B and class AB.

ELEC3405
Communications Electronics and Photonics

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and a 2 hours lab/tutorial per week. **Prohibitions:** ELEC3402 **Assumed knowledge:** ELEC2401 Introductory Electronics or ELEC2104 Electronic Devices and Basic Circuits. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study provides an introduction to the fundamental operation and design of transmitter and receiver subsystems for two broad classes of communications systems: those based on electronic transmission and those based on optical transmission. In the area of electronic communication subsystems, the course presents transmitter and receiver design. Topics relating to the transmitter comprise electronic oscillator sources, tuned electronic amplifiers, and modulators. Topics relating to receiver design comprise RF and IF frequency selective amplifiers, mixers, demodulators, phase-lock loops, feedback amplifiers, and high frequency RF and microwave communication amplifiers. In the area of optical communication subsystems, the course presents photonic transmitters and receivers. On the transmitter side this focuses on the principles of light generation in optical sources such as semiconductor lasers and light emitting diodes, electro-optic modulation of light, and optical amplifiers. On the receiver side, photodetectors, optical receivers, and front-end circuits are discussed. The principles and design of these subsystems are considered with reference to a basic optoelectronic communication link.

ELEC3505
Communications

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures per week and 3 hours lab and 3hrs tutorial per fortnight. **Prohibitions:** ELEC3503 **Assumed knowledge:** Confidence in mathematical operation usually needed to handle telecommunications problems such as Fourier transform, fundamental in signals and systems theory, convolution, and similar techniques. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This is an intermediate unit of study in telecommunications following on the general concepts studied in earlier units such as Signal and Systems and leading on to more advanced units such as Digital Communication Systems. Student will learn how to critically design and evaluate digital communication systems including the elements of a digital transmission system, understand the limitations of communications channels, different analog and digital modulation schemes and reasons to use digital techniques instead of analog, and the effect of noise and interference in performance of the digital communication systems. On completion of this unit, studentss will have sufficient knowledge of the physical channel of a

telecommunications network to approach the study of higher layers of the network stack.

The following topics are covered. Introduction to communications systems, random signals and stochastic process, components, signals and channels, sampling, quantization, pulse amplitude modulation (PAM), pulse code modulation (PCM), quantization noise, time division multiplexing, delta modulation. Digital communications: baseband signals, digital PAM, eye diagram, equalization, correlative coding, error probabilities in baseband digital transmission, bandpass transmission, digital amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK) and quadrature shift keying (QPSK), error probabilities in bandpass digital transmission, a case study of digital communication systems. Introduction to information theory: fundamental limits in communications, channel capacity and channel coding, signal compression.

ELEC3506
Data Communications and the Internet

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours tutorials per week. 2 hours of laboratory per fortnight. **Prohibitions:** NETS2150, NETS2009, NETS2909, NETS3007, NETS3907, ELEC3504, ELEC4501 **Campus:** Camperdown/Darlington **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, ATM and OSI). Circuit switched and packet switched communication. Network node functions and building blocks. LAN, MAN and WAN technologies. ATM systems. Protocols fundamental mechanisms. The TCP/IP core protocols (IP, ICMP, DHCP, ARP, TCP, UDP etc.). Applications and protocols (FTP, Telnet, SMTP, HTTP etc.).

ELEC3607
Embedded Computing

Credit points: 6 **Session:** Semester 1 **Classes:** 1 hour of lectures and 3 hours of laboratory per week. **Prerequisites:** ELEC1601 and ELEC2602 **Prohibitions:** ELEC2601 **Assumed knowledge:** ELEC1101 Foundations of Computer Systems, or ELEC1601 Professional Computer Engineering or ELEC2602 Digital System Design. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The aim of this unit of study is to teach students about microprocessors and their use. This includes architecture, programming and interfacing of microcomputers, peripheral devices and chips, data acquisition, device monitoring and control and communications.

ELEC3608
Computer Architecture

Credit points: 6 **Session:** Semester 2 **Classes:** 2hrs lecture per week and 2hrs lectures/labs per week. **Prerequisites:** ELEC2602 **Assumed knowledge:** Basic knowledge of digital logic is required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study explores the design of a computer system at the digital logic level. Topics covered include instruction sets, computer arithmetic, performance evaluation, datapath design, pipelining, memory hierarchies including caches and virtual memory, I/O devices, and bus-based I/O systems. Students will design a pipelined reduced instruction set processor.

ELEC3609
Internet Software Platforms

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours lecture and 2 hours tutorials per week **Prerequisites:** INFO1103, INFO2110, INFO2120 **Prohibitions:** EBUS4001 **Campus:** Camperdown/Darlington **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:** 2 hours project work in class and 1 hr tutorials per week. **Prerequisites:** INFO2120 **Prohibitions:** EBUS3003, EBUS3001 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit 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:

- technology fundamentals,
- business models (B2C, B2B and B2E systems),
- development methodologies, including writing use cases and UML diagrams), the Project Proposal and Project Specification Document,
- prototyping approaches: Ruby on Rails and WebRatio
- Other quality factors: Information Architecture, Fundamentals of HCI 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 CTO's.

Specific topics covered include:

- Electronic Commerce Technology Fundamentals
- The e-project
- Prototyping with Ruby on Rails and WebRatio
- B2C, B2B and B2E systems.

ELEC3702
Management for Engineers

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures, 2 hours of tutorials per week. **Prohibitions:** ELEC3701, ENGG3005, MECH3661 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to develop an understanding of the principles and practices of industry, to provide an overview of the various issues facing an industrial organisation, and of the basic approaches to their management, to understand the changing nature and effects of globalisation on Australia's economic performance, the competitiveness of Australian firms, and the generation of employment and wealth, to gain an insight into the importance of innovation at all levels and functions of all organisations, and of the ways of developing people-skills and organisational styles to promote innovation, to develop the broader skills required by employers of engineers, and to understand the objectives and roles appropriate to governments.

The following topics are covered; Introduction to engineers and management, Strategic planning, Operations and project management, Communication and people in organisations, Management and leadership, Economics and managerial finance, Accounting and

management, Marketing, Human Resource Management, Industrial relations, The global knowledge economy, Legal and ethical environment of business.

ELEC3802
Fundamentals of Biomedical Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of lab/tutorial per week. **Prohibitions:** ELEC3801 **Assumed knowledge:** A knowledge of basic electrical engineering is required: Ohm's law, Thevenin and Nortons' theorems, basic circuit theory involving linear resistors, capacitors and inductors, a basic knowledge of bipolar and field effect transistor theory, simplified theoretical mechanism of operation of transformers. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit assumes a knowledge of basic principles in physics, mathematics, circuit theory and electronics. In particular, some understanding of the following is required: Thevenins and Nortons theorems, Fourier analysis, radiation, filtering, bipolar and field effect transistors, and operational amplifiers.

The following topics are covered. Biology of the heart, circulatory and respiratory systems, physiology of nerve and muscle cells, fundamental organization of the brain and spinal cord. Medical instrumentation. ElectrocardioGram and automated diagnosis. Heart pacemakers and defibrillators. The bionic ear. Apparatus for treatment of sleep disordered breathing(sleep apnoea).

This unit is descriptive and does not require detailed knowledge of electronics or mathematics, but does require an understanding of some key aspects of mathematical and electronic theory. The unit concentrates on some of the practical applications of biomedical engineering to patient diagnosis and treatment.

ELEC3901
Electrical Exchange Unit 1A

Credit points: 6 **Session:** Semester 1 **Classes:** A workload that is equivalent to one quarter of that of a (normal) full time student at the exchange university. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This is a unit of study for the University of Sydney students who have gone on exchange and are doing unit(s) with a syllabus that is equivalent to unit(s) of study in the School of Electrical & Information Engineering. The enrollment in this unit needs to be approved by the school. The enrollment in this unit will be granted for a workload that is equivalent to one quarter of that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit.

ELEC3902
Electrical Exchange Unit 1B

Credit points: 12 **Session:** Semester 1 **Classes:** A workload that is equivalent to one half of that of a (normal) full time student at the exchange university. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This is a unit of study for the University of Sydney students who have gone on exchange and are doing unit(s) with a syllabus that is equivalent to unit(s) of study in the School of Electrical & Information Engineering. The enrollment in this unit needs to be approved by the school. The enrollment in this unit will be granted for a workload that is equivalent to one quarter of that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in any WAM calculations.

ELEC3903
Electrical Exchange Unit 1C

Credit points: 24 **Session:** Semester 1 **Classes:** A workload that is equivalent to that of a (normal) full time student at the exchange university. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This is a unit of study for the University of Sydney students who have gone on exchange and are doing unit(s) with a syllabus that is equivalent to unit(s) of study in the School of Electrical & Information Engineering. The enrollment in this unit needs to be approved by the school. The enrollment in this unit will be granted for a workload that is equivalent to one quarter of that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in any WAM calculations.

ELEC3904
Electrical Exchange Unit 2A

Credit points: 6 **Session:** Semester 2 **Classes:** A workload that is equivalent to one quarter of that of a (normal) full time student at the exchange university. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This is a unit of study for the University of Sydney students who have gone on exchange and are doing unit(s) with a syllabus that is equivalent to unit(s) of study in the School of Electrical & Information Engineering. The enrollment in this unit needs to be approved by the school. The enrollment in this unit will be granted for a workload that is equivalent to one quarter of that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in any WAM calculations.

ELEC3905
Electrical Exchange Unit 2B

Credit points: 12 **Session:** Semester 2 **Classes:** A workload that is equivalent to one half of that of a (normal) full time student at the exchange university. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This is a unit of study for the University of Sydney students who have gone on exchange and are doing unit(s) with a syllabus that is equivalent to unit(s) of study in the School of Electrical & Information Engineering. The enrollment in this unit needs to be approved by the school. The enrollment in this unit will be granted for a workload that is equivalent to one quarter of that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in any WAM calculations.

ELEC3906
Electrical Exchange Unit 2C

Credit points: 24 **Session:** Semester 2 **Classes:** A workload that is equivalent to that of a (normal) full time student at the exchange university. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This is a unit of study for the University of Sydney students who have gone on exchange and are doing unit(s) with a syllabus that is equivalent to unit(s) of study in the School of Electrical & Information Engineering. The enrollment in this unit needs to be approved by the school. The enrollment in this unit will be granted for a workload that is equivalent to one quarter of that of a (normal) full time student at the exchange university. Assessment is set by the exchange university. A Pass/Fail grade is awarded by the University of Sydney in this unit. Thus the marks obtained at the exchange university will not be included in any WAM calculations.

ELEC4505
Digital Communication Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours lab/tutorial per week. **Prohibitions:** ELEC4502 **Assumed knowledge:** ELEC3505 Communications **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Digitally modulated signals: non-linear modulation methods, continuous phase FSK, continuous phase modulation. Modulated carrier data transmission: QPSK, QAM, MFSK, MSK. Trellis coded modulation and modem technologies. Spread spectrum, including frequency hopping and CDMA principles. Plus selected topics from: Optical communication systems - single and multi-channel systems, performance criteria and systems analysis. Satellite communications systems. Cellular mobile radio systems.

ELEC4702
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Not applicable. **Prerequisites:** 24 credit points of level 3 or 4 units of study. **Campus:** Camperdown/Darlington **Mode of delivery:** Professional Practice

The Bachelor of Engineering degree requires students to obtain industrial work experience of twelve weeks (60 working days) duration towards satisfying the requirements for award of the degree. Students may undertake their work experience after completion of a minimum of 24 credit points of Year 3 units of study when they have built up a sufficient background of engineering. In general, the type of job that is acceptable for work experience should be in an engineering environment but not necessarily in the same discipline of the degree the student is pursuing. The student is required to inform the School of any work arrangements made by email.

Assessment in this unit is by the submission of a written report of about 4-6 pages on the industrial experience undertaken. The report is to describe the overall structure of the company, the areas that the student became familiar with and their relationship to the firm and, finally, what the student did. A certificate from the company stating the period of employment and the type of work you have undertaken should be attached to your report. The student should inform the company that a short report on the work experience is to be submitted to the School.

The report is to be submitted to the School electronically (see details on the course website). There is no deadline for submission of the report but it is a good practice to submit it in the first two weeks after the new semester started.

ELEC4706
Project Management

Credit points: 6 **Session:** Semester 1 **Classes:** 1 hour of lectures per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To introduce aspects relevant to the management of an engineering design project, namely: Why all projects are design projects, Engineering design, Intellectual property, The business plan, The design process, Understanding the client's problem, Objectives and Metrics, Functions and Specifications, Finding Answers to the Problem, Reporting the Outcome, Managing the Design Process, Design for Manufacture, Cost, Reliability, Quality and Sustainability, Ethics in Engineering

ELEC4710
Engineering Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** There are no lectures for this unit. However, the students are expected to spend at least one full day per week undertaking background research work, organizing their plan of work and preparing their experimental or developmental program. **Prerequisites:** 36 credit points of units of study from level 3 and above. **Prohibitions:** ELEC4703, ELEC4705, ELEC4707 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment in the following sessions: Semester 2.

This unit of study builds on the technical competencies introduced in the previous years. The project work is spread over two units (Engineering Project A and B). In Engineering Project A, students are required to plan and begin work on their project and roughly complete half the work required for the whole 'final year' project. In particular, it should include almost all the planning, literature review, and a significant proportion of the experimental or analytical work required of the project. The student will prepare a Progress Report at the end of semester detailing the context of the problem, relevant background research and progress to date. The progress at the end of Engineering Project A will be evaluated by the supervisor based on the thoroughness of the proposed program and the progress achieved during the semester. The student can only progress to Engineering Project B on attainment of a satisfactory result in Engineering Project A.

In Engineering Project B, the students are required to complete the remaining aspects of the project, present their results to their peers and academic staff in a seminar format, and prepare and submit a detailed Treatise.

The final grade is based on the work done in both Engineering Project A and B, and will be awarded upon successful completion of Engineering Project B.

ELEC4711
Engineering Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** There are no lectures for this unit. However, the students are expected to spend at least one full day per week to complete the remaining aspects of the project, and present their results in a seminar format, and prepare a detailed Treatise. **Prerequisites:** ELEC4710 Engineering Project A **Prohibitions:** ELEC4703, ELEC4705, ELEC4707 **Assumed knowledge:** 36 credit points of units of study from level 3 and above **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Students will work individually or in groups on an assigned project for the semester. The concepts covered depend on the nature of the project, but broadly cover research and inquiry, and information literacy.

ELEC4712
Honours Thesis A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** There are no lectures for this unit. However, the students are expected to spend at least one full day per week undertaking background research work, organizing their plan of work and preparing their experimental or developmental program. **Prerequisites:** 36 credit points of units of study from level 3 and above **Corequisites:** ELEC4713 **Prohibitions:** ELEC4703, ELEC4705, ELEC4707 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Students will work individually or in groups on an assigned project for the semester. The concepts covered depend on the nature of the project, but broadly cover research and inquiry, and information literacy.

ELEC4713
Honours Thesis B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** There are no lectures for this unit. However, the students are expected to spend at least one full day per week to complete the remaining aspects of the project, and present their results in a seminar format, and prepare a detailed Treatise. **Prerequisites:** 36 credit points of units of study from level 3 and above **Corequisites:** ELEC4712 **Prohibitions:** ELEC4707, ELEC4711 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Students will work individually or in groups on an assigned project for the Semester. The concepts covered depend on the nature of the project, but broadly cover research and inquiry, and information literacy.

School of Information Technologies

COMP2007
Algorithms and Complexity

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prohibitions:** COMP2907, COMP3309, COMP3609, COMP3111, COMP3811 **Assumed knowledge:** INFO1105, MATH1004 or MATH1904 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit provides an introduction to the design and analysis of algorithms. The main aims are (i) to learn how to develop algorithmic

solutions to computational problem and (ii) to develop understanding of algorithm efficiency and the notion of computational hardness.

COMP2121
Distributed Systems & Network Principles

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs per week, Tutorial 2 hrs per week. **Prerequisites:** (INFO1103 or INFO1903) AND (INFO1105 or INFO1905) **Corequisites:** (COMP2007 OR COMP2907) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit will provide a broad introduction to the principles of distributed systems and their design; provide students the fundamental knowledge required to analyse and construct various types of distributed systems; explain the common architectural principles and approaches used in the design of networks at different scales (e.g. shared medium access and routing); introduce the programming skills required for developing distributed applications, and will cover the use of Java class libraries and APIs; cover common approaches and techniques in distributed resource management (e.g. task scheduling).

COMP2129
Operating Systems and Machine Principles

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hours per week, Laboratory 2 hours per week. **Prohibitions:** SOFT2130, SOFT2830, SOFT2004, SOFT2904, COMP2004, COMP2904 **Assumed knowledge:** Programming, as from INFO1103 **Campus:** Camperdown/Darlington **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, using existing tools as building blocks to complete a large-scale task.

COMP2555
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This unit of study is for University of Sydney students in the Exchange program studying at an overseas University.

COMP2556
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This unit of study is for University of Sydney students in the Exchange program studying at an overseas University.

COMP2557
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This unit of study is for University of Sydney students in the Exchange program studying at an overseas University.

COMP2558
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This unit of study is for University of Sydney students in the Exchange program studying at an overseas University.

COMP2907
Algorithms and Complexity (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prerequisites:** Distinction level result in INFO(1105 or INFO1905 or SOFT1002 or SOFT1902 **Assumed knowledge:** INFO1905, MATH1904 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

An advanced alternative to COMP2007; covers material at an advanced and challenging level. This unit provides an introduction to the design and analysis of algorithms. The main aims are (i) to learn how to develop algorithmic solutions to computational problem and (ii) to develop understanding of algorithm efficiency and the notion of computational hardness.

COMP3109
Programming Languages and Paradigms

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Tutorial 1hrs) per week **Assumed knowledge:** COMP2007 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit provides an introduction to the foundations of programming languages and their implementation. The main aims are to teach what are: grammars, parsers, semantics, programming paradigms and implementation of programming languages.

COMP3308
Introduction to Artificial Intelligence

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Tut 1hr) per week **Prohibitions:** COMP3608, COMP3002, COMP3902 **Assumed knowledge:** COMP2007 **Campus:** Camperdown/Darlington **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, and knowledge representation. Students who complete it will have an understanding of some of the fundamental methods and algortihms 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.

COMP3419
Graphics and Multimedia

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prohibitions:** MULT3306, MULT3606, MULT3019, MULT3919, MULT3004, MULT3904, COMP3004, COMP3904 **Assumed knowledge:** COMP2007, MATH1002 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Computer Graphics and Multimedia are core technologies to support an interdisciplinary computing and communication environment. This unit provides a broad introduction to the field of multimedia to meet the diverse requirements of application areas such as entertainment, industrial design, virtual reality, intelligent media management, medical imaging and remote sensing. The unit covers both the underpinning theories and the practices of manipulating and enhancing digital media including image, computer graphics, audio, computer animation, and video. It introduces principles and cutting-edge techniques such as multimedia data processing, content analysis, media retouching, media coding and compression. It elaborates on various multimedia coding standards. A particular focus is on principles and the state-of-the-art research and development topics of Computer Graphics such as modelling, rendering and shading, and texturing.

COMP3456
Computational Methods for Life Sciences

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prerequisites:** INFO1105 and (COMP2007 or INFO2120) and 6 credit points from BIOL or MBLG **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit introduces the algorithmic principles driving advances in the life sciences. It discusses biological and algorithmic ideas together, linking issues in computer science and biology and thus is suitable for students in both disciplines. Students will learn algorithm design and analysis techniques to solve practical problems in biology.

COMP3520
Operating Systems Internals

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prohibitions:** NETS3304, NETS3604, NETS3009, NETS3909, COMP3009, COMP3909 **Assumed knowledge:** COMP2129, INFO1105 **Campus:** Camperdown/Darlington **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). The contents also include concepts of distributed systems: naming and binding, time in distributed systems, resource sharing, synchronization models (distributed shared memory, message passing), fault-tolerance, and case study of distributed file systems.

COMP3556
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

COMP3557
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

COMP3558
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

COMP3559
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

COMP3608
Intro. to Artificial Intelligence (Adv)

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Prac 1hrs) per week. **Prerequisites:** Distinction-level results in some 2nd year COMP or MATH or SOFT units. **Prohibitions:** COMP3308, COMP3002, COMP3902 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

An advanced alternative to COMP3308; covers material at an advanced and challenging level.

COMP3615
Software Development Project

Credit points: 6 **Session:** Semester 2 **Classes:** (Meeting with academic supervisor 1hr & Class meeting 1hr) per week **Prerequisites:** INFO3402 **Prohibitions:** INFO3600, SOFT3300, SOFT3600, SOFT3200, SOFT3700 **Campus:** Camperdown/Darlington **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 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.

INFO1003
Foundations of Information Technology

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** (Lec 2 hrs & Prac 2hrs) per week **Prohibitions:** INFO1000 or INFS1000 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Information technologies (IT) and systems have emerged as the primary platform to support communication, collaboration, research, decision making, and problem solving in contemporary organisations. The essential necessity for all university students to acquire the fundamental knowledge and skills for applying IT effectively for a wide range of tasks is widely recognised. Foundations of Information Technology (INFO1003) is an introductory unit of study which prepares students from any academic discipline to develop the necessary knowledge, skills and abilities to be competent in the use of information technology for solving a variety of problems. The main focus of this unit is on modelling and problem solving through the effective use of using IT. Students will learn how to navigate independently to solve their problems on their own, and to be capable of fully applying the power of IT tools in the service of their goals in their own domains while not losing sight of the fundamental concepts of computing. Students are taught core skills related to general purpose computing involving a range of software tools such as spreadsheets, database management systems, internet search engine, HTML, and JavaScript. Students will undertake practical tasks including authoring an interactive website using HTML, JavaScript and AJAX and building a small scale application for managing information. In addition, the course will address the many social, ethical, and intellectual property issues arising from the wide-spread use of information technology in our society.

INFO1103
Introduction to Programming

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** (Lec 1hr & Lab 2hrs) per week **Prohibitions:** SOFT (1001 or 1901) or COMP (1001 or 1901) or DECO2011 **Assumed knowledge:** HSC Mathematics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Programming in a legible, maintainable, reusable way is essential to solve complex problems in the pervasive computing environments. This unit will equip students with foundation of programming concepts that are common to widely used programming languages. The "fundamentals-first & objects-later" strategy is used to progressively guide this introductory unit from necessary and important building blocks of programming to the object-oriented approach. Java, one of the most popular programming languages, is used in this unit. It provides interdisciplinary approaches, applications and examples to support students from broad backgrounds such as science, engineering, and mathematics.

INFO1105
Data Structures

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prohibitions:** INFO1905 or SOFT (1002 or 1902) or COMP (1002 or 1902 or 2160 or 2860 or 2111 or 2811 or 2002 or 2902) **Assumed knowledge:** Programming, as for INFO1103 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit will teach some powerful ideas that are central to quality software: data abstraction and recursion. It will also show how one can analyse the scalability of algorithms using mathematical tools of asymptotic notation. Contents include: both external "interface" view, and internal "implementation" details, for commonly used data structures, including lists, stacks, queues, priority queues, search trees, hash tables, and graphs; asymptotic analysis of algorithm scalability, including use of recurrence relations to analyse recursive code. This unit covers the way information is represented in each structure, algorithms for manipulating the structure, and analysis of asymptotic complexity of the operations. Outcomes include: ability to write code that recursively performs an operation on a data structure; experience designing an algorithmic solution to a problem using appropriate data structures, coding the solution, and analysing its complexity.

INFO1551
Information Technology Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

INFO1903
Informatics (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 3hrs & Prac 3hrs) per week **Prerequisites:** ATAR sufficient to enter BCST(Adv), BIT or BSc(Adv), or portfolio of work suitable for entry **Assumed knowledge:** HSC Mathematics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit covers advanced data processing and management, integrating the use of existing productivity software, e.g. spreadsheets and databases, with the development of custom software using the powerful general-purpose Python scripting language. It will focus on skills directly applicable to research in any quantitative domain. The unit will also cover presentation of data through written publications and dynamically generated web pages, visual representations and oral presentation skills. The assessment, a long project, involves the demonstration of these skills and techniques for processing and presenting data in a choice of domains.

INFO1905
Data Structures (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prerequisites:** 75% or greater in INFO1103 or INFO1903 **Prohibitions:** INFO1105 or SOFT (1002 or 1902) or COMP (1002 or 1902) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

An advanced alternative to INFO1105; covers material at an advanced and challenging level. See the description of INFO1105 for more information.

INFO1911
IT Special Project 1A

Credit points: 6 **Session:** Semester 1 **Classes:** Meeting 1 hour per week, project work 8 hours per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Enrolment in this unit of study is by invitation only.

This unit of study is specially designed for students in their first year of study who is an academic high achiever, as well as talented in IT areas of study. In this unit, students will be involved in advanced projects, which may be research-oriented, in which students apply problem solving and IT skills.

INFO1912
IT Special Project 1B

Credit points: 6 **Session:** Semester 2 **Classes:** Meeting 1 hour per week, project work 8 hours per week. **Assumed knowledge:** ATAR of at least 98 and High Distinction average in first year IT units of study and Distinction average in first year non-IT units of study. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Departmental permission is required.

This unit of study is specially designed for students in their first year of study who is an academic high achiever, as well as talented in IT areas of study. In this unit, students will be involved in advanced projects, which may be research-oriented, in which students apply problem solving and IT skills.

INFO2110
Systems Analysis and Modelling

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prohibitions:** INFO2810, INFO2000, INFO2900 **Assumed knowledge:** Experience with a data model as in INFO1003 or INFO1103 or INFS1000 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit provides a comprehensive introduction to the analysis of complex systems. Key topics are the determination and expression of system requirements (both functional and non-functional), and the representation of structural and behavioural models of the system in UML notations. Students will be expected to evaluate requirements documents and models as well as producing them. This unit covers essential topics from the ACM/IEEE SE2004 curriculum, especially from MAA Software Modelling and Analysis.

INFO2120
Database Systems 1

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 3hrs & Prac 2hrs) per week **Prohibitions:** INFO2820, INFO2005, INFO2905 **Assumed knowledge:** Some exposure to programming and some familiarity with data model concepts such as taught in INFO1103 or INFO1003 or INFS1000 or INFO1903 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The proper management of data is essential for all data-centric 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. 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, 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 online analytic processing, and the use of XML as a data integration language.

INFO2315
Introduction to IT Security

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 1hr) per week **Prohibitions:** NETS3305, NETS3605, NETS3016, NETS3916, ELEC5610, ELEC5616 **Assumed knowledge:** Computer literacy **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit provides a broad introduction to the field of IT security. We examine secure and insecure programs, secure and insecure information, secure and insecure computers, and secure and insecure network infrastructure. Key content includes the main threats to security; how to analyse risks; the role in reducing risk that can be played by technical tools (such as encryption, signatures, access control, firewalls, etc); the limitations of technical defences; and the simple process and behavioural changes that can reduce risk.

INFO2551
Information Technology Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

INFO2552
Information Technology Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

INFO2820
Database Systems 1 (Advanced)

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 4hrs & Prac 2hrs) per week **Prerequisites:** Distinction-level result in INFO1003 or INFO1103 or INFO1903 or INFO1105 or INFO1905 **Prohibitions:** INFO2120, INFO2005, INFO2905 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The proper management of data is essential for all data-centric applications and for effective decision making within organizations. 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, deductive databases and DATALOG, which are all 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.

INFO2911
IT Special Project 2A

Credit points: 6 **Session:** Semester 1 **Classes:** Meeting 1 hour per week, project work 8 hours per week. **Prerequisites:** Distinction average in non-IT units completed in previous year of study, high distinction average in IT units completed in previous year. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Departmental permission required.

This unit of study enables talented students to apply their IT knowledge from their first year study to more advanced and exciting projects. In this unit, students will be provided with the opportunity to be involved in projects will a greater research focus.

INFO2912
IT Special Project 2B

Credit points: 6 **Session:** Semester 2 **Classes:** Meeting 1 hour per week, project work 8 hours per week. **Prerequisites:** Distinction average in non-IT units completed in previous year of study, high distinction average in IT units completed in previous year. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Departmental permission required.

This unit of study enables talented students to apply their IT knowledge from their first year study to more advanced and exciting projects. In this unit, students will be provided with the opportunity to be involved in projects will a greater research focus.

INFO3220
Object Oriented Design

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Prac 2 hrs) per week **Prohibitions:** SOFT3301, SOFT3601, SOFT3101, SOFT3801, COMP3008, COMP3908 **Assumed knowledge:** INFO2110, INFO1105 **Campus:** Camperdown/Darlington **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:** (Lec 2hrs & Prac 1hr) per week **Prohibitions:** MULT3307, MULT3607, MULT3018, MULT3918, SOFT3102, SOFT3802, COMP3102, COMP3802 **Assumed knowledge:** INFO2110 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit will introduce techniques to evaluate software user interfaces using heuristic evaluation and user observation techniques. Students will (i) learn how to design formal experiments to evaluate usability hypothesis and (ii) apply user centered design and usability engineering principles to design software user interfaces. A brief introduction to the psychological aspects of human-computer interaction will be provided.

INFO3402
Management of IT Projects and Systems

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Prac 1hr) per week. **Prohibitions:** ISYS3000, ISYS3012, ELEC3606 **Assumed knowledge:** INFO2000, INFO2110, INFO2810, INFO2900 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This course introduces the basic processes and techniques for managing IT projects, systems and services, throughout the IT lifecycle. It addresses both the technical and behavioural aspects of IT management at the enterprise level. Major topics include: organisational strategy and IT alignment, IT planning, project planning, tracking, resource estimation, team management, software testing, delivery and support of IT services, service level agreements, change and problem management, cost effectiveness and quality assurance.

INFO3404
Database Systems 2

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prohibitions:** INFO3504, INFO3005, INFO3905, COMP3005, COMP3905 **Assumed knowledge:** Introductory database study such as INFO2120 or INFO2820 or INFO2005 or INFO2905. Students are expected to be familiar with SQL and the relational data model, and to have some programming experience. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study builds upon INFO2120 Database Systems 1 and provides a comprehensive overview of the internal mechanisms of Database Management Systems (DBMS) and other systems that manage large data collections. These skills are needed for successful performance tuning and to understand the scalability challenges faced by the information age. 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 database engine. Topics include: physical data organization and disk-based index structures, query processing and optimisation, locking and logging, and database tuning. The second part focuses on the large-scale management of textual data such as by an information retrieval system or with web search engines. Topics include: distributed and replicated databases, information retrieval, document management, text index structures, web retrieval and page rank algorithms. The unit will be of interest to students seeking an introduction to database tuning, disk-based data structures and algorithms, and information retrieval. It will be valuable to those pursuing such careers as Software Engineers, Database Experts, Database Administrators, and e-Business Consultants.

INFO3504
Database Systems 2 (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prerequisites:** Distinction-level result in INFO2120 or INFO2820 or COMP2007 or COMP2907 **Prohibitions:** INFO3404, INFO3005, INFO3905, COMP3005, COMP3905 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study builds upon INFO2820 Database Systems 1 (Adv) and provides a comprehensive overview of the internal mechanisms of Database Management Systems (DBMS) and other systems that manage large data collections. These skills are needed for successful performance tuning and to understand the scalability challenges faced by the information age. 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 database engine. Topics include: physical data organization and disk-based index structures, query processing and optimisation, locking and logging, and database tuning. The second part focuses on the large-scale management of textual data such as by an information retrieval system or with web search engines. Topics include: distributed and replicated databases, information retrieval, document management, text index structures, web retrieval and page rank algorithms. This is an advanced alternative to INFO3404; it covers material at an advanced and challenging level. In particular, students in this advanced stream will study an actual DBMS implementation on the source code level, and also gain practical experience in extending the DBMS code base.

INFO3551
Information Technology Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

INFO3552
Information Technology Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

INFO3553
Information Technology Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

INFO3600
Major Development Project (Advanced)

Credit points: 12 **Session:** Semester 2 **Classes:** Project Work - in class 2 hours per week, Site Visit 1 hour per week, Meeting 1 hour per week. **Prerequisites:** INFO3402 **Prohibitions:** COMP3615, ISYS3400, SOFT3300, SOFT3600, SOFT3200, SOFT3700 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Only available to students in BIT, BCST(Adv) or BSc(Adv)

This unit will provide students an opportunity to carry out substantial aspects of a significant software development project. The project will be directed towards assisting a client group (from industry or with strong industry links). The student's contribution could cover one or more aspects such as requirements capture, system design, implementation, change management, upgrades, operation, and/or tuning. Assessment will be based on the quality of the delivered outputs, the effectiveness of the process followed, and the understanding of the way the work fits into the client's goals, as shown in a written report.

INFO3911
IT Special Project 3A

Credit points: 6 **Session:** Semester 1 **Classes:** Meeting 1 hour per week, project work 8 hours per week. **Prerequisites:** Distinction average in non-IT units completed in previous year of study, high distinction average in IT units completed in previous year. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Departmental permission required.

This unit of study enables talented students with maturing IT knowledge to integrate various IT skills and techniques to carry out projects which are predominantly research-intensive.

INFO3912
IT Special Project 3B

Credit points: 6 **Session:** Semester 2 **Classes:** Meeting 1 hour per week, project work 8 hours per week. **Prerequisites:** Distinction average in non-IT units completed in previous year of study, high distinction average in IT units completed in previous year. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Departmental permission required.

This unit of study enables talented students with maturing IT knowledge to integrate various IT skills and techniques to carry out projects which are predominantly research-intensive.

ISYS1551
Information Systems Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

ISYS1552
Information Systems Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

ISYS2140
Information Systems

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Prac 3hrs) per week **Prohibitions:** ISYS2006. ISYS2007 **Assumed knowledge:** INFO1003 or INFS1000 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study will provide a comprehensive conceptual and practical introduction to information systems (IS) in contemporary organisations. Content: General Systems Theory; Basic concepts of organisations, systems and information; The role of information systems in operating and managing organisations; How IS and the Internet enables organisations to adopt more competitive business models, including e-Commerce; The technologies that underpin IS; Distributed systems, including security, networking principles, the client server model and how distributed components locate and communicate with each other; The integration of disparate systems both within the organisation and between organisations, including the role of XML; Behavioural, managerial and ethical issues in implementing and managing IS.

ISYS2554
Information Systems Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

ISYS2555
Information Systems Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

ISYS2556
Information Systems Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

ISYS2557
Information Systems Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

ISYS3400
Information Systems Project

Credit points: 6 **Session:** Semester 2 **Classes:** (Meeting with academic supervisor 1hr & Class meeting 1hr) per week **Prerequisites:** (INFO3402 or ISYS3012) and (ISYS3401 or ISYS3015) **Prohibitions:** INFO3600, ISYS3207 **Assumed knowledge:** INFO2120 **Campus:** Camperdown/Darlington **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
Analytical Methods & Information Systems

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Prac 1hr) per week **Prohibitions:** ISYS3015 **Assumed knowledge:** INFO2110, ISYS2140 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This course will provide an introduction to the scientific approach and basic research methods that are relevant for conceptualizing and solving complex problems encountered Information Systems practice. A collection of different methods for collecting and analyzing information will be studied in the context of a few typical information system projects. These methods include surveys, controlled experiments, questionnaire design and sampling.

ISYS3554
Information Systems Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

ISYS3555
Information Systems Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

ISYS3556
Information Systems Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

ISYS3557
Information Systems Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

This Unit of Study is for University of Sydney students in the Exchange program studying at an overseas university.

School of Information Technologies (Honours units)

COMP4011
Computer Science Honours A

Credit points: 12 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Students enrolled in the Honours programs study various advanced aspects of Computer Science. The program may include lectures, tutorials, seminars and practicals. They will undertake a research project. Assessment will include the project and may include examinations and classwork.

COMP4012
Computer Science Honours B

Credit points: 12 **Session:** Semester 1, Semester 2 **Corequisites:** COMP4011 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Students enrolled in the Honours programs study various advanced aspects of Computer Science. The program may include lectures, tutorials, seminars and practicals. They will undertake a research project. Assessment will include the project and may include examinations and classwork.

COMP4013
Computer Science Honours C

Credit points: 12 **Session:** Semester 1, Semester 2 **Corequisites:** COMP4012 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Students enrolled in the Honours programs study various advanced aspects of Computer Science. The program may include lectures, tutorials, seminars and practicals. They will undertake a research project. Assessment will include the project and may include examinations and classwork.

COMP4014
Computer Science Honours D

Credit points: 12 **Session:** Semester 1, Semester 2 **Corequisites:** COMP4013 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Students enrolled in the Honours programs study various advanced aspects of Computer Science. The program may include lectures, tutorials, seminars and practicals. They will undertake a research project. Assessment will include the project and may include examinations and classwork.

COMP4551
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit of study is for University of Sydney students in the Exchange program studying at an overseas University.

COMP4552
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit of study is for University of Sydney students in the Exchange program studying at an overseas university.

COMP4553
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit of study is for University of Sydney students in the Exchange program studying at an overseas university.

COMP4554
Computer Science Exchange

Credit points: 6 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit of study is for University of Sydney students in the Exchange program studying at an overseas University.

INFO4991
IT Research Thesis A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 12 hours per week research work (including interaction with supervisor and research group). **Prerequisites:** Enrolment in Honours (BCST or BIT) **Corequisites:** INFO4992 and INFO5993 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Students enrolled in the Honours programs study various advanced aspects of Information Technology. The program may include lectures, tutorials, seminars and practicals. They will undertake a research project. Assessment will include the project and may include examinations and classwork.

INFO4992
IT Research Thesis B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** 24 hours per week research work (including interaction with supervisor and research group). **Prerequisites:** Enrolment in Honours (BCST or BIT) **Corequisites:** INFO4991 and INFO5993 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Students enrolled in the Honours programs study various advanced aspects of Information Technology. The program may include lectures, tutorials, seminars and practicals. They will undertake a research project. Assessment will include the project and may include examinations and classwork.

INFO4999
Computer Science Honours Result

Session: Semester 1, Semester 2 **Prerequisites:** Permission of the Head of Department **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

All SIT Honours students must enrol in this non assessable unit of study in their final semester.

ISYS4301
Information Systems Honours A

Credit points: 12 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Students enrolled in the Honours programs study various advanced aspects of Information Systems. The program may include lectures, tutorials, seminars and practicals. They will undertake a research project. Assessment will include the project and may include examinations and classwork.

ISYS4302
Information Systems Honours B

Credit points: 12 **Session:** Semester 1, Semester 2 **Corequisites:** ISYS4301 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

See ISYS4301

ISYS4303
Information Systems Honours C

Credit points: 12 **Session:** Semester 1, Semester 2 **Corequisites:** ISYS4302 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

See ISYS4301

ISYS4304
Information Systems Honours D

Credit points: 12 **Session:** Semester 1, Semester 2 **Corequisites:** ISYS4303 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

See ISYS4301

Common Engineering Faculty units of study

ENGG1061
Advanced Engineering 1A

Credit points: 6 **Session:** Semester 1, Semester 2 **Prerequisites:** ATAR score of at least 98 and good performance in HSC Maths, Physics and Chemistry. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The project is a major component of this unit of study. Students will be allotted to groups based on their preferences and will work on a particular project. Although the project will be supervised by a senior Faculty member, the emphasis here is on the team members setting and achieving their own goals, and presenting their work in both oral and written form. Groups will be expected to complete an engineering project by the end of Semester 1.

ENGG1800
Engineering Disciplines (Intro) Stream A

Credit points: 6 **Session:** Semester 1 **Classes:** 1 hours of lecture and one 3 hour laboratory session per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit introduces students to specialisations in the Engineering discipline areas of Aeronautical, Biomedical Chemical, Civil, Mechanical and Mechatronic Engineering, and Project Engineering and Management. By providing first-year students with an experience of these various engineering streams, the unit aims to develop the students' professional identity as an engineer and thus provide a suitable basis on which students can choose their discipline for further study.

Introductory sessions in the School of Aerospace,

Mechanical and Mechatronic Engineering

-4 weeks-

An overview of the degree requirements in each stream. The roles of the engineer in each stream (employments, skills, etc). How each of the subjects taught relate to the skills/knowledge and applications required of the engineers. Basically make sure students fully understand what engineers are in the discipline areas and why the students do the subjects they do. In each stream, one engineering technical topic will be taught as a problem solving exercise, and this topic will be the focus of the laboratory.

School of Civil Engineering

-4 weeks-

Introductory lectures in Engineering Economics and Construction Planning, Foundation Engineering, Structural Engineering, Materials, Environmental Engineering. Each student will be involved in the erection and dismantling of an 8 metre high steel and timber tower in the Civil Engineering Courtyard. Preliminary lectures related to the tower will include safety issues, loading, statical analysis, foundation calculations, construction management, engineering drawings and detailing, geometric calculations, and survey measurements. Exercises related to these issues will be performed before assembly and disassembly of the tower.

School of Chemical and Biomolecular Engineering

-4 weeks-

This course will enable students to gain an appreciation of: the methods and materials of construction of items of process equipment; the role of this equipment in building an entire chemical processing plant: its operation and maintenance and safety requirements and procedures. Students will dismantle, disassemble and operate items of process equipment. They will present written answers to questions, supplemented by drawings of process flowsheets, diagrams of dismantled equipment, and discussions of heat and mass balances and of process parameters.

ENGG1801
Engineering Computing

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hour of lectures and 2 hours of computer laboratory sessions per week. **Prohibitions:** INFO1000, COSC1001, COSC1002, INFO1003 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit will introduce students to fundamental principles of programming. The language used will be Matlab but the principles taught are readily portable to other languages like C and Java. The unit material will be presented in a manner which will help students to draw a connection between programming constructs and real engineering applications. The unit will use engineering inspired case-studies : especially from Civil, Chemical, Aerospace and Mechanical streams, to motivate new material. Besides introductory concepts like variables, arrays and loops, the unit will also introduce more sophisticated Matlab data structures like structs and cells. The extensive Matlab library for visualization will also be introduced. Matlab will cover two-thirds of the unit. The remaining one-third will be devoted to the use of Excel in engineering scenarios. Furthermore, cross integration between Matlab and Excel will also be highlighted.

ENGG1802
Engineering Mechanics

Credit points: 6 **Session:** Semester 2, Summer Main **Classes:** 2hrs of lectures per week, 3hrs of tutorials per week **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit aims to provide students with an understanding of and competence in solving statics problems in engineering. Tutorial sessions will help students to improve their group work and problem solving skills, and gain competency in extracting a simplified version of a problem from a complex situation. Emphasis is placed on the ability to work in 3D as well as 2D, including the 2D and 3D visualization of structures and structural components, and the vectorial 2D and 3D representations of spatial points, forces and moments.

ENGG1803
Professional Engineering 1

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 2 hours lectures, 2 hours tutorial/project work per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Professional Engineering 1 is an introductory Unit of Study within the Faculty of Engineering. The semester 1 course is aimed at students from the School of Aerospace, Mechanical and Mechatronic Engineering. It seeks to introduce newly admitted undergraduates to general principles of professional engineering practice, a range of contemporary professional engineering issues, plus outline skills related to academic study within an engineering environment. The subject is structured around a team based design and build project, in which students apply the professional engineering concepts they are learning to an engineering project. Professional engineering topics to be covered include: accessing information, teamwork, creativity, leadership, written and oral communication, project management, problem solving, ethics, liability, occupational health and safety and environmental issues.

ENGG1805
Professional Engineering and IT

Credit points: 6 **Session:** Semester 1 **Classes:** 2hrs lectures and 2 hrs of lab per week **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

It is the intention of the Faculty of Engineering and Information Technologies to integrate the acquisition of certain generic attributes seamlessly into all units taught by the School. In ENGG1805 - Professional Engineering and Information Technology, this intention is reflected in the objectives of the Unit of Study, the specific topics included in lectures and tutorials, the skills and commitment of the teaching team and in the way in which students' contributions and work is assessed.

ENGG2004
Engineering Studies B

Credit points: 4 **Session:** Semester 1, Semester 2, Summer Main **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Special project specified for individual requirement.

ENGG2005
Engineering Studies C

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Main **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Special project specified for individual requirement.

ENGG2008
Engineering Studies A

Credit points: 2 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Special project specified for individual requirement.

ENGG2062
Engineering Project: Business Plan 2 Adv

Credit points: 6 **Session:** Semester 1 **Classes:** 1hr Lecture, 2hr Project work in class per week **Prerequisites:** WAM of 75% or greater for 1st year studies. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This course aims to extend student experience beyond the design and build phase of engineering to the business planning necessary to transform a good idea into a commercial reality. It will provide the opportunity for students to develop a range of skills used by professional engineers in a business environment, including planning, strategy development and assessment, business environment and market analysis together with financial management and resource allocation.

ENGG3005
Engineering & Industrial Management Fund

Credit points: 6 **Session:** Semester 2 **Classes:** 2hrs lectures, 2 hrs tutorials per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Engineers and management; communication; micro-and macro-economics; strategic management; business planning; legal

responsibilities; industrial hazard management; human resource management; industrial relations; project management; quality assurance; operations management; accounting and financial management.

This unit is to introduce students to a range of management concepts and techniques, and to develop an understanding of the role and challenges of management

ENGG3062
Technology Education (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** 1hr Lecture; 2hrs Project work in class per week. **Prerequisites:** WAM of 75% or greater in 2nd year of studies. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This UoS aims to give the student experience in critically engaging an audience in the theoretical and practical understanding of engineering and technology. Students will learn professional skills in client relationship management, teaching and presenting, project management, leadership and teamwork. This work will be carried out with partner schools to enhance the engineering knowledge and understanding of Stage 5 high school students. This UoS places students in an environment with which they are familiar, albeit in a very different and challenging role. It allows them the opportunity to deliver a project for a professional external client and in doing so showcase engineering, the faculty and the University to the wider community.

ENGG4061
Innovation/Technology Commercialisation

Credit points: 6 **Session:** Semester 1 **Classes:** 1 hr lecture; 1 hour project work in class per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS is designed as a Master Class for final year Engineering students to grapple with the challenges of engaging in, facilitating and managing innovation and developing competence in entrepreneurship and technology commercialisation. Issues covered will include the major elements in the management of technological innovation, including forecasting, R&D, technology acquisition, business strategy, financial control and marketing. Through case studies and field research on innovative companies, students will develop an understanding of the complexities of entrepreneurship, issues involved in commercialisation of research and technology, and in the start-up of a new technology-based venture.

ENGG4064
Advanced Engineering Design A

Credit points: 6 **Session:** Semester 2 **Classes:** project work - own time **Prerequisites:** WAM of 75% or greater in Senior Year of Studies. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The aim to this unit is to develop an understanding of the practice of engineering, utilising a diverse range of skills to solve complex problems. Students will gain skills in design, analysis and management by undertaking a significant project in a multi-disciplinary team comprising students from across the faculty. Each student will be required to work in a team to

produce an integrated design in greater detail than is possible in ordinary classes and to write a significant design report presenting the results of the process. The ability to work in a team of engineers from different disciplines will be assessed as part of this design project. We try to centre projects around a client, which can be an industrial facility, the Campus and Property Services Office of the University, Research departments within the university, or outside clients (e.g. Nature Conservation Council NSW).

Elements drawn from: Introduction to the design process, Clarification of the Brief, Inquiry, brainstorming, Design philosophy,

Design optimization, Equipment design and costing, Hazard assessment, Environmental Impact Assessment, Project financial Analysis, Business planning.

ENGG4065
Advanced Engineering Design B

Credit points: 6 **Session:** Semester 2 **Classes:** project work - own time **Prerequisites:** This unit is an extension module for students in ENGG4064. WAM of 75% or greater in Senior Year of Studies. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The aim to this unit is to develop an understanding of the practice of engineering, utilising a diverse range of skills to solve complex problems. Students will gain skills in design, analysis and management by undertaking a significant project in a multi-disciplinary team comprising students from across the faculty. Each student will be required to work in a team to produce an integrated design in greater detail than is possible in ordinary classes and to write a significant design report presenting the results of the process. The ability to work in a team of engineers from different disciplines will be assessed as part of this design project. We try to centre projects around a client, which can be an industrial facility, the Campus and Property Services Office of the University, Research departments within the university, or outside clients (e.g. Nature Conservation Council NSW). Elements drawn from: Introduction to the design process, Clarification of the Brief, Inquiry, brainstorming, Design philosophy, Design optimization, Equipment design and costing, Hazard assessment, Environmental Impact Assessment, Project financial Analysis, Business planning.

7. Postgraduate degrees

This chapter contains the regulations governing postgraduate degrees offered by the Faculty of Engineering and Information Technologies.

Doctor of Engineering Practice

Course Resolutions

1 Course codes

Code	Course title
HB002	Doctor of Engineering Practice

2 Definitions

(1) In these Resolutions:
- (a) **Committee** - means the Committee for Postgraduate Studies of the Faculty of Engineering and Information Technologies;
- (b) **Dean** - means the Dean of the Faculty of Engineering and Information Technologies;
- (c) **degree** - means the degree of Doctor of Engineering Practice;
- (d) **school** - means the school in the Faculty of Engineering and Information Technologies in which the candidate is proceeding;
- (e) **embedded program** - is a program of study in the graduate certificate/graduate diploma/master's degree by coursework sequence which allows unit of study credit points to count in more than one of the awards;
- (f) **Faculty** - means the Faculty of Engineering and Information Technologies;
- (g) **unit of study** or **unit** - is the smallest stand-alone component of a candidate's course that is recordable on a candidate's transcript;
- (h) **University** - means the University of Sydney.

3 Admission to candidature

(1) An applicant for admission to candidature shall:
- (a) apply in writing to the Dean;
  (i) hold, or have fulfilled the requirements for the award of, the degree of Bachelor of Engineering of the University of Sydney with First or Second Class Honours; or
  (ii) hold, or have fulfilled the requirements for the award of, a Master's degree of the Faculty of Engineering of the University of Sydney that has been completed by research; or
  (iii) hold, or have fulfilled the requirements for the award of, a master's degree of the Faculty of Engineering of the University of Sydney that has been completed by coursework with at least a Credit grade average; or
  (iv) hold qualifications from another faculty of the University of Sydney or from another tertiary institution considered by the Dean to be the equivalent of those prescribed in sections 3(1)(a)(i)-3(1)(a)(iii) above;
- (b) submit with the application:
  (i) an outline of the proposed course of advanced study and research, including the general area of the proposed thesis;
  (ii) evidence of at least three years' recent, full-time experience In Engineering or Project Management as the Dean shall consider appropriate for postgraduate study at this level; and
  (iii) such evidence of adequate training and ability to pursue the proposed program of study as the Dean may require.

(2) An applicant for admission to either part-time candidature or candidature by distance education/flexible learning shall, in addition to the above, also submit with the application a written undertaking that he or she:
- (a) will have sufficient time available to complete the requirements for the degree in accordance with these Resolutions; and
- (b) will be able to attend at the University at such times and on such occasions for purposes of consultation and participation in schoolal activities as may be required by the head of the relevant school or the Dean.

4 Probationary acceptance

(1) A candidate shall be accepted on a probationary basis or a period not exceeding two semesters, and, upon completion of this probationary period. the Dean
- (a) shall review the candidate's work; and
- (b) shall either confirm the candidate's status or terminate the candidature.

(2) In the case of a candidate accepted on a probationary basis, the candidature shall be deemed to have commenced from the date of such acceptance.

5 Availability

(1) Admission to candidature may be limited by quota.
(2) In determining the quota the University will take Into account:
- (a) availability of resources, including space, library, equipment and computing facilities; and
- (b) availability of adequate and appropriate supervision. In considering an applicant for admission to candidature, the Dean may take account of the quota and will select in preference applicants who are most meritorious in terms of the eligibility for admission criteria.

6 Degree requirements

(1) In order to complete the requirements for the degree, a candidate shall complete a total of 144 credit points comprising the following advanced coursework and research:
- (a) approved postgraduate units of study totalling 48 credit points; and
- (b) a doctoral seminar program and a thesis totalling 96 credit points.

7 Units of study

(1) The postgraduate units of study approved by the Committee are those offered for the coursework masters degrees in the Faculty.
(2) The Dean may permit a candidate to include within the required 48 credit points of units of study up to a maximum of 24 credit points for postgraduate units of' study offered by another faculty the University or by another tertiary institution, subject to the approval of that other body.
(3) Notwithstanding any permission to include units of study offered by another faculty in accordance with section 2 above or any credit granted for previous study in accordance with section 11(1)(b) below, a candidate must complete at least

24 credit points of units of study offered for the coursework master's degrees in the Faculty.

8 Seminar program and supervised research

(1) In the doctoral seminar program a candidate must present three research colloquia to his or her peers in the form of a thesis proposal and two 'work in progress' seminars, one of which might be analogous to an oral defence of the nearly-completed thesis.
(2) A candidate must carry out, under supervision, a research project in a field of study approved by the Dean.
(3) The research project will normally comprise the investigation a specific aspect or specific aspects of either the candidate's own and/or others' professional practice.
(4) While normally only one research project is undertaken, the Dean may permit a candidate to undertake research in a series of different projects that must be related and form a by coherent body of research.

9 The thesis

(1) On completing the course of advanced study and research, a candidate shall present a thesis embodying the work undertaken in the research project, that shall be a substantially original contribution to the subject concerned.
(2) The candidate shall state, generally in the preface and specifically in notes;
    (a) the sources from which the information is derived;
    (b) the extent to which use has been made of the work of others; and
    (c) the portion of the work the candidate claims as original.
(3) The thesis shall normally be approximately 60,000 words (that is, about 200 pages) and shall in no circumstances be longer than 80,000 words.
(4) The topic of the thesis must have the prior approval of the Dean.
(5) A candidate may also submit in support of the candidature any publication of which the candidate is the sole or joint author.
    (a) In such a case the candidate must produce evidence to identify satisfactorily the sections of the work for candidate is responsible.
(6) A candidate may not present as the thesis any work that has been presented for a degree or diploma at this or another University, but the candidate will not be precluded from incorporating such in the thesis, provided that, in presenting the thesis, the candidate indicates the part of the work which has been so incorporated.
(7) The thesis shall be written In English.
(8) A candidate shall submit to the relevant school four copies of which the thesis and four copies of a summary of about 300 words in length.
(9) The copies of the thesis submitted for examination will be either printed copies or, where prior approval has been obtained from the relevant head of school, in the form of CDs, as provided in the Resolutions of the Academic Board relating to the form of the thesis for the degree of Doctor of Philosophy.
(10) The thesis shall be accompanied by a certificate from supervisor stating whether, in the supervisor's opinion, the form of presentation of the thesis is satisfactory.
(11) When the degree has been awarded, a hard copy of the thesis printed on archival paper and incorporating any required emendations and revisions shall be lodged in the University Library, except as provided in section 21 below.

10 Length of candidature

(1) A candidate may proceed either on a full-time or part-time basis
(2) Except with the express approval of the Dean:
    (a) a full-time candidate shall complete the degree requirements:
        (i) no earlier than the end of the sixth semester of candidature; and
        (ii) no later than the end of the eighth semester of candidature; and
    (b) a part-time candidate shall complete the degree requirements:
        (i) no earlier than the end of the eighth semester of candidature; and
        (ii) no later than the end of the sixteenth Semester of candidature.
    (c) Where a candidate is granted credit for previous studies in accordance with section 11 below, the candidate's minimum and maximum length of candidature may be adjusted accordingly.
    (d) Where a candidate is granted a period of suspension of candidature, this period will not count as part of the time-limits prescribed above in section 10(2)(a) and (b) above.
    (e) Where a candidate is granted permission to change from full to part-time candidature, or the reverse, the minimum and maximum lengths of candidature will be amended pro-rate.

11 Credit transfer

(1) *Coursework component*
    (a) A candidate who, at the date of admission to candidature, has completed postgraduate coursework (whether a degree for that work has been awarded or not) may apply for credit of transfer towards the degree.
    (b) On the recommendation of the relevant head of school, the Dean may grant a candidate credit for previous studies provided that:
        (i) the coursework for which credit is sought is deemed the Dean to have been completed with a high level of competency and to be relevant to the candidate's total program of study; and
        (ii) no more than 24 credit points shall normally be so credited results of the unless the units of study for which credit is sought were completed in an embedded program at this University, in which case there shall be no restriction on the amount of credit that may be granted.
(2) *Research component*
    (a) A candidate who, at the date of admission to candidature, has completed not less than one semester as a candidate and for a degree of master in the Faculty of Engineering and Information Technologies or in another faculty in the University of Sydney, may be permitted by the Dean to is, transfer credit for the whole or any part of that candidature towards the DEngPrac degree, provided that:
        (i) the period of candidature for the degree of master for which credit is sought shall have been in a program of full-time or part-time advanced study and research under a supervisor appointed by the faculty and directly related to the candidate's proposed course of advanced study and research for the DEngPrac degree; and
        (ii) the candidate shall have abandoned candidature for that degree of master.
    (b) A candidate who, at the date of admission to candidature, has completed not less than one semester as a candidate for the degree of Doctor of Philosophy in the University of Sydney may be permitted by the Dean to transfer credit for the whole or any part of that candidature towards the DEngPrac degree, provided that:
        (i) the period of candidature for the PhD degree for credit is sought shall have been in a program directly related to the candidate's proposed course of advanced study and research for the DEngPrac degree; and
        (ii) the candidate shall have abandoned candidature for the PhD degree.
    (c) A candidate who, at the date of admission, has completed not less than one semester as a candidate for a higher degree in another university or institution may be credited for the whole or any part of that

period of candidature towards the DEngPrac degree, provided that:
(i) the period of candidature for the higher degree for which credit is sought shall have been in a program of full-time or part-time advanced study and research under a supervisor appointed by the other university or institution concerned and is directly related to the candidate's proposed course of advanced study and research for the DEngPrac degree;
(ii) the candidate shall have abandoned candidature for the higher degree of the other university or institution concerned for which credit is sought; and
(iii) the amount of credit which may be so granted shall not exceed two semesters.

12 Control of candidature

Where a candidate is employed by an institution other than the University, the Dean may require a statement from that employer acknowledging that the candidature will be under the control of the University.

13 Location of candidature

(1) Subject to the approval of the supervisor, relevant head of school and the Dean, a candidate shall pursue the program of advanced study and research:
  (a) within the University, including its research centres;
  (b) on fieldwork either in the field or in libraries, museums or other repositories;
  (c) within industrial laboratories or research institutions or other institutions considered by the Dean to provide adequate facilities for that candidature; or
  (d) within a professional working environment considered to be appropriate by the Dean.

(2) A candidate shall be regarded as engaging in work within the University if he or she is undertaking approved distance and/or off-campus study, this being a mode of study in which the student would not be in regular physical attendance on a designated campus of the University.

(3) A candidate must, however, be able to attend the University at such times and on such occasions for the purposes of consultation and participation in prescribed academic and educational activities, as may be required by the relevant head of school.

(4) Except in respect of a candidate undertaking approved distance and/or off-campus study, a candidate pursuing candidature outside Australia must also complete a cumulative minimum period of two semesters of candidature within the University.

14 Supervision

(1) *Appointment of supervisor*
  (a) The Dean, on the recommendation of the relevant head of school, shall appoint a suitably qualified supervisor for each candidate to take primary responsibility for the conduct of the candidature.
  (b) The Dean, on the recommendation of the relevant head of school, shall normally appoint one or more associate supervisors for each candidate to assist in the supervision of that candidature.

(2) *Qualifications of supervisors*
  (a) A person appointed as a supervisor must be:
  (i) a member of the academic staff;
  (ii) a member of the senior research staff;
  (iii) a person upon whom the Senate has conferred an academic title or a clinical academic title; or
  (iv) such other member of the staff of the University as may be considered appropriate in a particular case by the Graduate Studies Committee of the Academic Board.

(3) *Qualifications of associate supervisors*
  (a) A person appointed as an associate supervisor must:
  (i) hold the qualifications referred to in section 14(2); or
  (ii) have been appointed as an honorary associate of the University.

15 Progress

(1) *Annual review*
  (a) At the end of each year of candidature, each candidate shall complete and submit an annual progress report form to provide evidence of progress to the satisfaction of the supervisor, the relevant head of school and the Dean.
  (b) The supervisor shall comment on the candidate's report, and the form will then be referred back to the candidate who shall sign the report to indicate that he or she has sighted the supervisor's comments.
  (c) The form shall then be referred to the head of the relevant school, who, on the basis of the evidence provided, shall recommend the conditions of candidature to apply for the following year.
  (d) The head may require the candidate to provide further evidence of progress at the end of one semester or such other period as the head considers appropriate.
  (e) The progress report form is then forwarded to the Dean for consideration and comment.

(2) *Interview at the end of the first year of candidature*
  (a) In addition to the requirement for the submission of an annual progress report, at the end of the first year of candidature each candidate's progress will be reviewed at an interview to be organised by the relevant school.
  (i) The review shall include an assessment of the research project including the resources being made available, the candidate's progress (including seminar performance) and the supervisory arrangements.
  (ii) If both the supervisor and the relevant head of school participate in the review, another member of staff - usually the school postgraduate coordinator - shall normally also participate in the review.
  (iii) There shall also be a segment where the candidate has the opportunity to discuss in confidence his or her progress in the absence of the supervisor.
  (iv) An outcome will be considered by the head of school, if not directly involved, and the Dean.
  (v) Where difficulties have been identified, the report will include an agreed course of action which may include discontinuation of candidature.

(3) *Lack of evidence of satisfactory progress*
  (a) If a candidate fails to submit evidence of progress or if the relevant head of school considers that the evidence submitted does not indicate satisfactory progress, the Dean may, on the head's recommendation:
  (i) call upon the candidate to show good cause why that candidature should not be terminated by reason of unsatisfactory progress towards completion of the degree; and
  (ii) where, in the opinion of the Dean, the candidate does not show good cause, the Dean may terminate that candidature or may impose conditions on the continuation of that candidature.
  (iii) For the purposes of these Resolutions, good cause means circumstances beyond the reasonable control of a candidate, which may include serious ill-health or misadventure, but does not include demands of employers, pressure of employment or time devoted to non-University activities, unless these are relevant to serious ill-health or misadventure.
  (iv) In all cases the onus is on the candidate to provide the University with satisfactory evidence to establish good cause.

16 Discontinuation of enrolment

(1) A candidate who wishes to discontinue enrolment in the degree or in a unit of study must apply to the relevant head of school and will be presumed to have discontinued

enrolment from the date of that application, unless evidence is produced showing:
(a) that the discontinuation occurred at an earlier date; and
(b) that there was good reason why the application could not be made at the earlier time.

(2) A candidate who discontinues enrolment in a unit of study shall have that discontinuation recorded as Withdrawn (W) or Discontinued not to count as failure (DNF) where that discontinuation occurs within the timeframes specified by the University or where the candidate meets other conditions as specified by the relevant head of school.

(3) A candidate who discontinues candidature for the degree shall have that discontinuation recorded as Withdrawn (W) or Not enrolled or Not continuing where that discontinuation occurs:
(a) within the time-frames specified by the University or
(b) where the candidate meets other conditions as specified by the relevant head of school.

(4) A candidate who discontinues candidature and who seeks to re-enrol as a candidate for the degree must apply for re-admission in accordance with procedures determined by the Committee.

17 Suspension of candidature

(1) A candidate must be enrolled in each semester m which he or she is actively completing the requirements for the degree.

(2) A candidate who wishes to suspend candidature must first obtain approval from the Dean.

(3) The candidature of a candidate who has not re-enrolled and who has not obtained approval from the Dean for suspension will be deemed to have lapsed.
(a) A student whose candidature has lapsed must apply for re-admission in accordance with procedures determined by the Committee.
(b) if re-admitted to candidature, the candidate shall complete the degree requirements under such conditions as determined by the Dean.

(4) A candidate who enrols after suspending candidature shall complete the requirements for the degree under such conditions as determined by the Dean.

18 Examination

Except as prescribed in these resolutions, the examination procedures shall be in accordance with the policies and procedures prescribed by the Academic Board for the degree of Doctor of Philosophy.

19 Appointment of Examiners

(1) On receiving the thesis and having considered the certificate of the supervisor, the Dean shall consult with the relevant head of school and, if the Dean sees fit, appoint examiners.

(2) If the Dean resolves to appoint examiners, three independent examiners shall be appointed.

(3) Of the examiners so appointed:
(a) at least two examiners shall be external to the University;
(b) the supervisor may not be appointed as an examiner;
(c) an industry-based associate professor may not be appointed as an external examiner; and
(d) each examiner shall hold a professional doctorate or PhD level qualification and/or be a member of staff at a recognised university at the level of professor or associate professor.

(4) The Dean shall report the names of the examiners appointed to the PhD Award Subcommittee of the Graduate Studies Committee of the Academic Board, which may appoint one or more additional examiners.

(5) In any case where the Dean, having received the thesis and having considered the report of the supervisor, resolves not to appoint examiners, the Dean shall report the circumstances to the PhD Award Subcommittee of the Graduate Studies Committee of the Academic Board.

20 Determination of the result of the candidature

(1) The Head of Department will refer the results of the coursework and the examiners' reports on the thesis, together with a recommendation concerning the award of the degree, to the Faculty Board.

(2) The Head's recommendation for the thesis shall then be treated as for a PhD (section 3 of the Resolutions for PhD), in that the award of the degree can be made if the Head recommends typographical corrections or minor emendations.

(3) If the Head recommends that changes asked for by the examiners not be carried out, or there is disagreement among the examiners, then the Faculty shall forward a report (along with the Head's report and the student's comments on the examiner's reports) to the PhD Award Subcommittee of the Academic Board's Graduate Studies Committee, which shall determine the result of the candidature.

21 Public availability of thesis

(1) It is the policy of the Senate that a candidate for a higher degree should not normally be permitted to undertake a program of advanced study and research which is likely to result in the lodgement of a thesis that cannot be available for use immediately, to be read, photocopied or microfilmed, except as provided in sections 21(3) and 21(4) below.

(2) An applicant for admission to candidature for a higher degree shall be required to acknowledge awareness of this policy when applying for such admission.

(3) Use of confidential material and access to a restricted thesis
(a) If, at any time between application for admission to candidature and the lodgement of the thesis, it shall appear to the supervisor and to the relevant head of school that successful prosecution of the candidature will require the use of confidential material which the candidate would not be at liberty fully to disclose in the thesis, the matter shall be reported as soon as practicable to the Dean.
(b) The Dean may, if the Dean thinks fit, recommend to the Graduate Studies Committee of the Academic Board that the candidate be granted:
(i) permission to include in an appendix to the thesis such material as is essential to the thesis but which, for a limited period, may not be available for general inspection; and
(ii) exemption, in respect of such an appendix, from the requirement to give the undertaking specified in section 21(2) above.
(c) Subject to the provisions in section 21(4) below, if the Graduate Studies Committee of the Academic Board resolves to grant such permission and exemption, the University Librarian shall restrict access, for a period to be specified by the Graduate Studies Committee of the Academic Board, to any appendix referred to in section 21(3)(b) above.
(i) This period of restriction shall not exceed five years unless there are exceptional reasons for an extension of the period.
(d) The University Librarian may grant access to an appendix to a thesis to which access has been restricted in accordance with section 21(3)(c) above, to a scholar who:
(i) demonstrates bona fide concern with the material in that appendix; and
(ii) has the written consent of either the author of the thesis; or the head of the relevant school in a case where the author cannot be contacted, notwithstanding that all reasonable steps have been taken to contact the author.
(e) Notwithstanding any other provision of these resolutions, the examiners of a thesis, including any Faculty committee or any committee of the Academic Board which is directly concerned with the examination of such thesis, shall have access to the thesis and any appendix to the thesis for the purposes of any examination or re-examination.

(4) *Deferment of public availability of thesis*

(a) The Senate recognises that there are certain circumstances where deferment of the public availability of the thesis is appropriate.

(b) In a case where a candidate or potential candidate is to be associated with a project in collaboration with industry that has potential for concern over exploitation of intellectual property, the Dean, if satisfied that the circumstances warrant it, may recommend to the Graduate Studies Committee of the Academic Board that:
(i) the candidate or prospective candidate be granted exemption from the requirement to give the undertaking specified in section 21(2) above; and
(ii) authorisation be given to delay lodgement of the thesis in the Library for a period that, except in exceptional circumstances, shall not exceed 18 months from the date of the award of the degree.

(c) The Chair of the Graduate Studies Committee of the Academic Board may approve such applications on behalf of the Graduate Studies Committee, where the Chair is satisfied that they are appropriate.

(d) If, at any time between application for admission to candidate and the lodgement of the thesis, it shall appear to the candidate, supervisor and to the relevant head of school that there are reasons to believe that the candidate's interests would be at risk if the thesis were Immediately made available, the candidate may apply in writing for deferment of the availability of that thesis in the University Library for a specific period of time.

(e) Any such application should set out clearly the reasons for the request and include supporting evidence, as appropriate.

(5) The Dean, if satisfied that such a deferment is necessary to protect the interests of the candidate, may:

(a) give authorisation for the thesis not to be lodged in the Library for a period not exceeding six months from the date of award of the degree; and may also

(b) recommend to the Graduate Studies Committee of the Academic Board that a longer period of deferment, or an extension of the original deferment, be approved provided that, except in exceptional circumstances, the total period shall not exceed 18 months.

22 Heads of school

A head of school may delegate to a specified member of the academic staff his or her responsibilities under these resolutions by:

(a) countersigning a specific recommendation in respect of a particular candidature; or

(b) making, and forwarding to the Registrar, a written statement of delegation of those powers.

Master of Philosophy

Resolutions of the Senate

1 Requirements for the Master of Philosophy

(1) A candidate who has been admitted in accordance with section 1 shall:
  (a) engage in research in some branch of Engineering or Information Technologies in the University of Sydney either full-time for not less than one year or part-time for not less than two years,
  (b) undertake units of study as the School or the Faculty may prescribe,
  (c) undergo a probationary period as imposed by the Faculty.

Resolutions of the Faculty

1 Course codes

Code	Course and stream title
HC051	Master of Philosophy

2 Admission requirements

(1) Except as provided in Part 9, *University of Sydney (Amendment Act) 1999*, an applicant for admission to candidature for the degree of Master of Philosophy shall:
  (a) be a graduate in Engineering or Information Technologies of the University of Sydney and have achieved First or Second Class Honours or a standard deemed acceptable by the Faculty; or
  (b) be a graduate of any other faculty of the University of Sydney and have achieved first or second class honours or a standard deemed acceptable by the Faculty; or
  (c) be a graduate of another institution holding equivalent qualifications to a graduate of the University of Sydney; and
  (d) have completed courses acceptable to the Faculty of Engineering and Information Technologies; and
  (e) have in the opinion of the Faculty reached First or Second Class Honours standard.

(2) Any applicant who furnishes evidence that satisfies the Faculty that a suitable standard of knowledge has been acquired, may be admitted by the Dean on the recommendation of the Head of School.

(3) Candidates who have completed a Masters by Coursework in the Faculty of Engineering and Information Technologies will be admitted to the MPhil provided that they:
  (a) achieve a minimum weighted average mark of 75% in the Masters by coursework, and
  (b) complete a research thesis with a weighting of at least 12 credit points and a minimum grade of Distinction.

(4) Candidates who have completed a Masters by coursework and have not achieved the requirements detailed in Section 2(3), may still be admitted to the MPhil subject to the approval of the Faculty.

3 Requirements of the degree

(1) A candidate who has been admitted in accordance with section 2 shall:
  (a) engage in research in some branch of Engineering or Information Technology in the University of Sydney either full-time for not less than one year or part-time for not less than two years
  (b) undertake units of study as the School or the Faculty may prescribe, and
  (c) undergo a probationary period as imposed by the Faculty.

4 Time limits

(1) A candidate shall, unless special permission is granted by the Faculty, complete the requirements of the degree, in the case of a full-time student not later than two years, and in the case of a part-time student not later than four years, after the commencement of candidature.

(2) The Faculty may include in the minimum period of candidature time spent in advanced study and research in the University of Sydney Faculty of Engineering and Information Technologies (or any other institution as approved by the Faculty) prior to the application for admission to candidature.

5 Suspension of candidature

Candidates seeking suspension for a semester or longer (up to 12 months) should apply in writing to the Faculty and should have their HECS status amended accordingly. Scholarship holders should also notify the Research Office of their intended periods of absence.

6 Supervision

(1) The Dean of the Faculty, on the recommendation of the Head of the School concerned, shall appoint a full-time member of the academic staff or research staff of the University to act as supervisor of each candidate.

(2) Where the supervisor is a member of the research staff, the Dean of the Faculty, on the recommendation of the Head of the School concerned, shall also appoint a member of the full-time academic staff as associate supervisor. Any person so appointed as associate supervisor must be capable of acting as supervisor in the event that the supervisor is no longer able to act.

(3) The Dean of the Faculty, on the recommendation of the Head of the School concerned, may appoint a full-time member of the academic staff of the University or other appropriately qualified person to act as associate supervisor.

7 Satisfactory progress

(1) A report on the progress towards completion of the requirements for the degree shall be submitted annually in respect of each candidate through the Head of School to the Faculty by the Postgraduate Advisor of the School concerned.

(2) Candidates deemed to have achieved outstanding performance may be recommended for an upgrade to PhD.

(3) If the candidate fails to submit evidence of progress or if the Faculty considers that the evidence submitted does not indicate satisfactory progress, the Faculty may call upon that candidate to show cause why that candidature should not be terminated by reason of unsatisfactory progress towards completion of the degree and where, in the opinion of the Faculty, the candidate does not show good cause the Faculty may terminate that candidature or may impose conditions on the continuation of that candidature.

8 Assessment and examination

(1) A candidate shall submit a thesis embodying the results of the research.

(2) A candidate may be required, at the discretion of the Faculty, to attend lectures, seminar courses or practical work courses or to undertake courses and, if required, the assessment of such courses, subject to the approval of the Faculty.

(3) A candidate shall state in the thesis, generally in a preface and specifically in notes;
  (a) the sources from which the information was derived;
  (b) the extent to which the work of others has been used; and
  (c) the portion of the work claimed as original.

(4) The candidate shall not present as the thesis any work previously submitted for a degree of this or any other institution, but may incorporate any work that has not been

submitted elsewhere, provided that the work so incorporated is indicated.

(5) A candidate shall lodge with the Faculty three copies (printed or typewritten) of the thesis.

(6) The thesis shall be accompanied by a certificate from the supervisor stating whether, in the supervisor?s opinion, the form of presentation of the thesis is satisfactory, and that the examiners have expertise in the field of the thesis.

(7) Having considered the certificate of the supervisor, the Faculty shall, if it thinks fit, appoint two examiners, one of which is external to the University of Sydney. The Supervisor shall not be one of the examiners.

(8) The examiners shall report to the Faculty which shall determine the result of the examination.

9 Previous work

The Faculty may deem time spent or work done (either at the University of Sydney or other institution as approved by the Faculty) towards the degree of Doctor of Philosophy by a candidate before admission to candidature to be time spent or work done after admission, provided that the candidate has ceased to be a candidate for the degree of Doctor of Philosophy.

10 Transition arrangements for candidates enrolled in Master of Engineering Research

Candidates enrolled in Master of Engineering Research (MER) may elect to continue with the current degree or transfer to MPhil in which case the time spent or work done towards the degree of MER by a candidate before admission to MPhil will be deemed time spent or work done towards the degree of MPhil after admission, provided that the candidate has ceased to be a candidate for the degree of MER.

Graduate Certificate in Engineering

Graduate Diploma in Engineering

Master of Engineering

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended)and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HG027	Graduate Certificate in Engineering
HF044	Graduate Diploma in Engineering
HC048	Master of Engineering

2 Attendance pattern

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

3 Embedded courses in this sequence

(1) The embedded courses in this sequence are:
  (a) the Graduate Certificate in Engineering
  (b) the Graduate Diploma in Engineering
  (c) the Master of Engineering
(2) Providing candidates satisfy the admission requirements for each stage, a candidate may progress to the award of any of the courses in this sequence. Only the longest award completed will be conferred.

4 Admission to candidature

(1) Available places will be offered to qualified applicants in the order in which complete applications are received, according to the following admissions criteria.
(2) Admission to the Graduate Certificate in Engineering requires a bachelor's degree from the University of Sydney or equivalent qualification.
(3) Admission to the Graduate Diploma in Engineering requires:
  (a) a bachelor's degree from the University of Sydney or equivalent qualification; or
  (b) completion of the embedded graduate certificate.
(4) Admission to the Master of Engineering requires:
  (a) a Bachelor of Engineering from the University of Sydney or equivalent qualification with a credit average; or
  (b) completion of the embedded graduate diploma or graduate certificate with a minimum credit average.
(5) Additional admission requirement for the Chemical and Biomolecular and the Biomedical streams:
  Admission to the Chemical and Biomolecular Engineering or the Biomedical Engineering requires completion of prerequisites equivalent to 12 credit points of mathematics, six credit points of computing and six credit points of biology, chemistry or related fundamental science units.
(6) In exceptional circumstances the Dean may admit applicants without these qualifications who, in the opinion of the faculty, have qualifications and evidence of experience and achievement sufficient to successfully undertake the award.

5 Requirements for award

(1) The units of study that may be taken for the courses are set out in the table of units of study: Graduate Certificate in Engineering/Graduate Diploma in Engineering/Master of Engineering.
(2) To qualify for the award of the Graduate Certificate in Engineering a candidate must complete 24 credit points of units of study from the prescribed tables.
(3) To qualify for the award of the Graduate Diploma in Engineering a candidate must complete 36 credit points of units of study from the prescribed tables.
(4) To qualify for the award of the Master of Engineering a candidate must complete 48 credit points, including:
  (a) 24 credit points of fundamental and/or specialist units of study from a relevant specialisation; and
  (b) 12 credit points of professional or research pathway units of study from a relevant specialisation; and
  (c) 12 credit points of elective units of study, except for Civil Engineering, Electrical Engineering and Mechanical Engineering specialisation, where these 12 credit points must be chosen from specialist units of study; and
  (d) candidates must complete a specialisation in one of the areas listed below.

6 Specialisations

Completion of a specialisation is a requirement of the Master of Engineering. A specialisation requires the completion of prescribed units of study listed in the table for that specialisation. The specialisations available are:

(a) *Chemical and Biomolecular Engineering specialisations*
  (i) Biophysical Processes
  (ii) Chemical and Biomolecular Engineering
  (iii) Environmental Engineering
  (iv) Sustainable Processing
(b) *Civil Engineering specialisations*
  (i) Civil Engineering
  (ii) Environmental Fluids
  (iii) Geotechnical Engineering
  (iv) Structural Engineering
(c) *Electrical and Information Engineering specialisations*
  (i) Electrical Engineering
  (ii) Network Engineering
  (iii) Power Engineering
  (iv) Wireless Engineering
(d) *Aerospace, Mechanical and Mechatronic Engineering specialisations*
  (i) Aerospace Engineering
  (ii) Biomedical Engineering
  (iii) Mechanical Engineering

7 Research Pathway

A candidate for the Master of Engineering must complete 24 credit points of units of study with an average mark of at least 75 or be given approval at the discretion of the postgraduate program director, before taking Research Pathway units.

8 Course transfer

(1) A candidate for the master or graduate diploma may elect to discontinue study and graduate with a shorter award from this embedded sequence, with the approval of the Dean, and provided the requirements of the shorter award have been met.
(2) A candidate who has had a certificate or diploma in this sequence conferred may apply for transfer of 12 credit points to the Master of Engineering.

9 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..

Master of Professional Engineering

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended)and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HC052	Master of Professional Engineering

2 Attendance pattern

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

3 Master's type

This master's degree is a professional master's course, as defined in the Coursework Rule.

4 Streams

(1) The Master of Professional Engineering is available in the following streams:
- (a) Aerospace Engineering
- (b) Biomedical Engineering
- (c) Chemical and Biomolecular Engineering
- (d) Civil Engineering
- (e) Electrical Engineering
- (f) Environmental Fluids
- (g) Geotechnical Engineering
- (h) Mechanical Engineering
- (i) Network Engineering
- (j) Power Engineering
- (k) Software Engineering
- (l) Structural Engineering
- (m) Wireless Engineering

(2) Completion of a stream is a requirement of the course. Candidates wishing to transfer between streams should contact the Faculty student office.

5 Admission to candidature

(1) Available places will be offered to qualified applicants in the order in which complete applications are received, according to the following admissions criteria.

(2) Admission to candidature requires:
- (a) a Bachelor of Engineering from the University of Sydney, or equivalent qualification, with a minimum credit average; or
- (b) a non-engineering bachelor's degree with a minimum credit average, with studies equivalent to 48 credit points in mathematics, physics, chemistry, biology, geology, computing or statistics, as related to the stream sought for admission.

(3) All candidates for admission must have prior learning equivalent to 96 credit points in total, which, in the estimation of the Dean, is comparable to the requirements for the first two years of a Bachelor of Engineering at this University in the stream sought for admission. Refer to the admission requirement tables in the handbook for a guide to acceptable prior learning units of study.

(4) Applicants, who require additional studies to satisfy the above entry requirements, may be granted conditional admission to the Master of Professional Engineering subject to completion of the Graduate Certificate in Engineering or the Graduate Diploma in Engineering with a credit average.

(5) In exceptional circumstances the Dean may admit applicants without these qualifications who, in the opinion of the faculty, have qualifications and evidence of experience and achievement sufficient to successfully undertake the award.

6 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: Master of Professional Engineering.

(2) To qualify for the award of the Master of Professional Engineering a candidate must complete 96 credit points, including core and elective units of study as listed in the table of units of study for each stream.

7 Credit for previous study

(1) Candidates transferring from the Master of Engineering to the Master of Professional Engineering may transfer up to 24 credit points provided units are equivalent to units of study offered in the Master of Professional Engineering. Any additional credit is subject to the approval by the Director of the Faculty of Engineering and Information Technologies School of Graduate Studies.

(2) A maximum of 36 credit points may be granted towards the Master of Professional Engineering from external postgraduate studies where no award has been, or will be made, provided the studies are acceptable to the Program Director and are equivalent to units of study offer in the Master of Professional Engineering.

(3) Candidates enrolled in the Graduate Certificate or Graduate Diploma of Engineering (Professional Engineering) in conjunction with the Master of Professional Engineering may be granted credit up to 18 credit points from prior learning.

(4) Candidates who have completed units of study in the Master of Professional Engineering are not able to automatically transfer credit to a Master of Engineering program. Credit for any applicable units of study will be determined by the Director of the Faculty of Engineering and Information Technologies School of Graduate Studies.

8 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.

Graduate Certificate in Project Management

Graduate Diploma in Project Management

Master of Project Management

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended)and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HG006	Graduate Certificate in Project Management
HF023	Graduate Diploma in Project Management
HC031	Master of Project Management

2 Attendance pattern

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

3 Master's type

The master's degree in these resolutions is a professional master's course, as defined by the Coursework Rule.

4 Embedded courses in this sequence

(1) The embedded courses in this sequence are:
  (a) the Graduate Certificate in Project Management
  (b) the Graduate Diploma in Project Management
  (c) the Master of Project Management
(2) Providing candidates satisfy the admission requirements for each stage, a candidate may progress to the award of any of the courses in this sequence. Only the longest award completed will be conferred.

5 Admission to candidature

(1) Available places will be offered to qualified applicants in the order in which complete applications are received, according to the following admissions criteria.
(2) Admission to the Graduate Certificate in Project Management requires:
  (a) a bachelor's degree from the University of Sydney or equivalent qualification; or
  (b) relevant industry experience and certifications.
(3) Admission to the Graduate Diploma of Project Management requires:
  (a) a bachelor's degree from the University of Sydney or equivalent qualification; or
  (b) completion of the embedded graduate certificate with a minimum credit average.
(4) Admission to the Master of Project Management requires:
  (a) a bachelor's degree from the University of Sydney or equivalent qualification with a minimum credit average; or
  (b) completion of the embedded graduate diploma with a minimum credit average.
(5) In exceptional circumstances the Dean may admit applicants without these qualifications who, in the opinion of the faculty, have qualifications and evidence of experience and achievement sufficient to successfully undertake the award.

6 Requirements for award

(1) The units of study that are required for the courses are set out in the table of units of study: Graduate Certificate in Project Management / Graduate Diploma of Project Management / Master of Project Management.
(2) To qualify for the award of the Graduate Certificate in Project Management a candidate must complete 24 credit points, including:
  (a) 12 credit points of foundation units of study;
  (b) 6 credit points of specialist units of study; and
  (c) 6 credit points of elective or professional practice units of study.
(3) To qualify for the award of the Graduate Diploma in Project Management a candidate must complete 36 credit points, including:
  (a) 12 credit points of foundation units of study;
  (b) 12 credit points of specialist units of study;
  (c) 6 credit points of professional practice units of study; and
  (d) 6 credit points of elective units of study.
(4) A candidate who has been admitted to the Master of Project Management shall proceed either: by professional practice pathway; or by research practice pathway.
(5) To qualify for the award of the Master of Project Management by professional practice pathway, a candidate must complete 48 credit points, including:
  (a) 12 credit points of foundation units of study;
  (b) 12 credit points of specialist units of study;
  (c) 12 credit points of professional practice units of study; and
  (d) 12 credit points of elective units of study.
(6) Entry into the Master of Project Management research pathway requires special permission from the Program Director. To qualify for the award of the Master of Project Management by research pathway, a candidate must complete 48 credit points, including:
  (a) 12 credit points from foundation units of study;
  (b) 12 credit points from specialisation units of study prescribed by the faculty;
  (c) 12 credit points of research units of study;
  (d) 6 credit points of professional practice units of study; and
  (e) 6 credit points of elective units of study.

7 Specialisations

(1) Completion of a specialisation is not a requirement of the Master of Project Management. A specialisation requires the completion of 12 credit points from units of study listed in the table for that specialisation including the core unit. The specialisations available are:
  (a) International Project Management
  (b) Project Economics and Scheduling Management
  (c) Project Risk Management
  (d) Strategic PM Implementation

8 Cross-institutional study

Cross-institutional study is not available in these courses except where the University of Sydney has a formal cooperation agreement with another university.

9 Satisfactory progress

Progression is subject to the Coursework Rule. A candidate who has failed to meet these progression rules will be transferred to either the Graduate Diploma or the Graduate Certificate in Project Management, depending on the credit points successfully completed.

10 Course transfer

A candidate for the master or graduate diploma may elect to discontinue study and graduate with a shorter award from this embedded sequence, with the approval of the Director of the

Faculty of Engineering and Information Technologies Graduate School, and provided the requirements of the shorter award have been met.

11 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.

Graduate Certificate in Information Technology

Graduate Diploma in Information Technology

Master of Information Technology

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended)and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course Resolutions

1 Course codes

Code	Course title
HG025	Graduate Certificate in Information Technology
HF042	Graduate Diploma in Information Technology
HC049	Master of Information Technology

2 Attendance pattern

The attendance pattern for the courses is full time or part time according to candidate choice.

3 Master's type

The master's degree in these resolutions is a professional master's course, as defined by the Coursework Rule.

4 Embedded courses in this sequence

(1) The embedded courses in this sequence are:
  (a) the Graduate Certificate in Information Technology
  (b) the Graduate Diploma in Information Technology
  (c) the Master of Information Technology

(2) Providing candidates satisfy the admission requirements for each stage, a candidate may progress to the award of any of the courses in this sequence. Only the longest award completed will be conferred.

5 Admission to candidature

(1) Available places will be offered to qualified applicants based on merit, according to the following admissions criteria.

(2) Admission to the Graduate Certificate in Information Technology requires:
  (a) a bachelor's degree with a substantial study in a relevant field of Information Technology; or
  (b) the Bachelor of Engineering from the University of Sydney, or equivalent qualification, with a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering.

(3) Admission to the Graduate Diploma in Information Technology requires:
  (a) a bachelor's degree in any aspect of Information Technology; or
  (b) the Bachelor of Engineering from the University of Sydney, or equivalent qualification, with a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering; or
  (c) completion of the embedded graduate certificate with at least a credit average.

(4) Admission to the Master of Information Technology requires:
  (a) a bachelor's degree with at least a credit average and a major sequence of study in any aspect of Information Technology; or
  (b) the Bachelor of Engineering from the University of Sydney, or equivalent qualification, with at least a credit average and a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering; or
  (c) completion of the embedded graduate diploma with at least a credit average; or
  (d) completion of the Graduate Diploma in Computing from the University of Sydney with no more than 12 credit points of unit of study failed.

(5) In exceptional circumstances the Dean may admit applicants without these qualifications who, in the opinion of the faculty, have qualifications and evidence of experience and achievement sufficient to successfully undertake the award.

6 Requirements for award

(1) The units of study that may be taken for these awards are set out in the table of units of study: Master of Information Technology.

(2) From the table of units of study and with the approval of the Dean or nominee, a maximum of 18 credit points may be selected from units outside the School of IT, of which no more than 12 credit points may be from outside the Faculty of Engineering and IT.

(3) To qualify for the Graduate Certificate in Information Technology a candidate must complete 24 credit points of the Foundational or Specialist units of study.

(4) To qualify for the Graduate Diploma in Information Technology a candidate must complete 36 credit points, including:
  (a) a maximum of 24 credit points of the Foundational units of study; and
  (b) a minimum of 12 credit points of the Specialist units of study from the table of units of study excluding Project units and Core Professional Pathway units.

(5) To qualify for the Masters in Information Technology a candidate must complete 48 credit points, including:
  (a) all core units of study of either the Professional Pathway or the Research Path; and
  (b) maximum 24 credit points of Foundational units of study; and
  (c) all prescribed units of study for one defined specialisation or the research path.

7 Specialisations

(1) Completion of a specialisation is a requirement of the Master of Information Technology. A specialisation requires the completion of all core units of study as prescribed by the faculty and at least 18 credit points chosen from units of study listed in the table for the defined specialisation. The specialisations available are:
  (a) Business Information Systems
  (b) Computer Networks
  (c) Computer Science
  (d) Database Management Systems
  (e) Health Informatics
  (f) Multimedia Technology
  (g) Project Management
  (h) Software Engineering
  (i) Telecommunications Engineering.

8 Progression Rules

(1) A candidate for the Master of Information Technology must complete 24 credit points from Foundational or Specialist units of study with at least Credit average marks before taking any Information Technology Project units. Admission to project units of study is subject to availability of supervision and to the approval of the Dean or nominee.

(2) With permission from the Dean or nominee, a candidate for the Master of Information Technology who completed 24 credit points from Foundational or Specialist units of study with an at least Distinction average marks may take Research Path units.

9 Suspension of candidature

A student may seek written permission from the Dean to suspend candidature in the course. Suspension may be granted for a maximum of one year.

10 Cross-institutional study

Cross-institutional study is not available in these courses except where the University of Sydney has a formal cooperation agreement with another university.

11 Course transfer

A candidate for the master or graduate diploma may elect to discontinue study and graduate with a shorter award from this embedded sequence, with the approval of the Dean, and provided the requirements of the shorter award have been met.

12 Credit for previous study

(1) In addition to the general credit transfer rules of the Coursework Rule, the following restrictions on credit transfer into these courses apply:
   (a) where postgraduate study has been undertaken at the University of Sydney in one of the embedded courses of the Master of Information Technology Management and no award has been conferred, credit may be transferred in full, provided the study has been undertaken within the previous three years and subject to approval of the Academic Director;
   (b) where study has been undertaken at postgraduate level and no award has been conferred, credit to a maximum of 50% of the prescribed credit points may be transferred to the Graduate Diploma in Information Technology or the Master of Information Technology, provided:
   (i) the study has been undertaken at the University of Sydney, or at an external institution recognised by the University of Sydney, within the previous three years; and
   (ii) the units of study have been completed at credit level or above; and
   (iii) the units are equivalent to Core or Specialist units of study offered under the degree being taken, subject to approval of the Academic Director.
   (c) where study has been undertaken at postgraduate level and an award has been conferred, credit to a maximum of 12 credit points may be transferred to the Master of Information Technology, provided:
   (i) the study has been undertaken at an external institution recognized by the University of Sydney within the previous three years; and
   (ii) the units of study have been completed at credit level or above; and
   (iii) the units are equivalent to Core or Specialist units of study offered under the degree being taken, subject to approval of the Academic Director.

13 Satisfactory progress

Progression is subject to the Coursework Rule. A candidate who has failed to meet these progression rules will be transferred to either the Graduate Diploma or the Graduate Certificate in Information Technology, depending on the credit points successfully completed.

14 Time limit

(1) A candidate for the Graduate Certificate in Information Technology shall complete the requirements for the award in a minimum enrolment of one semester and a maximum enrolment of four semesters.
(2) A candidate for the Graduate Diploma in Information Technology shall complete the requirements for the award in a minimum enrolment of two semesters and a maximum enrolment of six semesters.
(3) A candidate for the Master of Information Technology shall complete the requirements for the award in a minimum of two semesters and a maximum of eight semesters.

15 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.

Graduate Certificate in Information Technology Management

Graduate Diploma in Information Technology Management

Master of Information Technology Management

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended)and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HG026	Graduate Certificate in Information Technology Management
HF043	Graduate Diploma in Information Technology Management
HC050	Master of Information Technology Management

2 Attendance pattern

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

3 Master's type

The master's degree in these resolutions is a professional master's course, as defined by the Coursework Rule.

4 Embedded courses in this sequence

(1) The embedded courses in this sequence are:
  (a) the Graduate Certificate in Information Technology Management
  (b) the Graduate Diploma in Information Technology Management
  (c) the Master of Information Technology Management
(2) Providing candidates satisfy the admission requirements for each stage, a candidate may progress to the award of any of the courses in this sequence. Only the longest award completed will be conferred.

5 Admission to candidature

(1) Available places will be offered to qualified applicants based on merit, according to the following admissions criteria.
(2) Admission to the Graduate Certificate in Information Techonology Management requires:
  (a) a bachelor's degree in a computing related area, with a minimum of three years professional experience in the IT industry; or
  (b) a bachelor's degree in any discipline, with a minimum of five years professional experience in the IT industry.
(3) Admission to the Graduate Diploma in Information Techonology Management requires:
  (a) a bachelor's degree in a computing related area, with a minimum of three years professional experience in the IT industry; or
  (b) a bachelor's degree in any discipline, with a minimum of five years professional experience in the IT industry; or
  (c) completion of the requirements of the embedded graduate certificate with at least a credit average.
(4) Admission to the Master of Information Technology Management requires:
  (a) a bachelor's degree in a computing related area with at least a credit average and a minimum of two years professional experience in the IT industry; or
  (b) a bachelor's degree in any discipline with at least a credit average and with a minimum of five years professional experience in the IT industry; or
  (c) completion of the requirements of the embedded graduate diploma with at least a credit average; or
  (d) completion of the Graduate Diploma in Computing from the University of Sydney with no more than 12 credit points of unit of study failed; or
  (e) completion of the Master of Information Technology from the University of Sydney.
(5) In exceptional circumstances the Dean may admit applicants without these qualifications who, in the opinion of the faculty, have qualifications and evidence of experience and achievement sufficient to successfully undertake the award.

6 Requirements for award

(1) The units of study that may be taken for the courses are set out in the table of units of study: Master of Information Technology Management.
(2) From the table of units of study and with the approval of the Dean or nominee, a maximum of 18 credit points may be selected from units outside the School of IT, of which no more than 12 credit points may be from outside the Faculty of Engineering and IT.
(3) To qualify for the award of the Graduate Certificate in Information Technology Management a candidate must complete 24 credit points of units of study as specified in the degree table.
(4) To qualify for the award of the Graduate Diploma in Information Technology Management a candidate must complete 36 credit points of units of study as specified in the degree table.
(5) To qualify for the award of the Master of Information Technology Management a candidate must complete 48 credit points of units of study as specified in the degree table.

7 Progression rules

(1) A candidate must complete 24 credit points of units of study with at least Credit average marks before taking any Information Technology Project units. Admission to project units of study is subject to availability of supervision and to the approval of the Dean or nominee.
(2) With permission from the Dean or nominee, a candidate for the Master of Information Technology Management who completed 24 credit points of units of study with at least Distinction average marks may take Research Path units.

8 Cross-institutional study

Cross-institutional study is not available in these courses except where the University of Sydney has a formal cooperation agreement with another university.

9 Course transfer

A candidate for the master's degree or graduate diploma may elect to discontinue study and graduate with a shorter award from this embedded sequence, with the approval of the Dean, and provided the requirements of the shorter award have been met.

10 Credit for previous study

(1) In addition to the general credit transfer rules of the Coursework Rule, the following restrictions on credit transfer into these courses apply:
  (a) Where postgraduate study has been undertaken at the University of Sydney in one of the embedded courses of the Master of Information Technology and no award has been conferred, credit may be transferred in full, provided the study has been

undertaken within the previous three years and subject to approval of the Academic Director.

(b) Where study has been undertaken at postgraduate level and no award has been conferred, credit to a maximum of 50% of the prescribed credit points may be transferred to the Graduate Diploma in Information Technology Management or the Master of Information Technology Management, if:
(i) the study has been undertaken at the University of Sydney, or at an external institution recognized by the University of Sydney, within the previous three years; and
(ii) the units of study have been completed at credit level or above; and
(iii) the units are equivalent to core (additional or mandatory) units of study offered under the degree being taken, subject to approval of the Academic Director.

(c) Where study has been undertaken at postgraduate level and an award has been conferred, credit to a maximum of 12 credit points may be transferred to the Master of Information Technology Management, provided:
(i) the study has been undertaken at an external institution recognized by the University of Sydney within the previous three years; and
(ii) the units of study have been completed at credit level or above; and
(iii) the units are equivalent to core (additional or mandatory) units of study offered under the degree being taken, subject to approval of the Academic Director.

11 Suspension of candidature

A student may seek written permission from the Dean to suspend candidature in the course. Suspension may be granted for a maximum of one year.

12 Satisfactory progress

Progression is subject to the Coursework Rule. A candidate who has failed to meet these progression rules will be transferred to either the Graduate Diploma or the Graduate Certificate in Information Technology Management, depending on the credit points successfully completed.

13 Time limit

(1) A candidate for the Graduate Certificate in Information Technology Management shall complete the requirements for the award in a minimum enrolment of one semester and a maximum enrolment of four semesters.
(2) A candidate for the Graduate Diploma in Information Technology Management shall complete the requirements for the award in a minimum enrolment of two semesters and a maximum enrolment of six semesters.
(3) A candidate for the Master of Information Technology Management shall complete the requirements for the award in a minimum of two semesters and a maximum of eight semesters.

14 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.

Graduate Diploma in Engineering (Professional Engineering)

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended)and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HF045	Graduate Diploma in Engineering (Professional Engineering)

2 Attendance pattern

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

3 Admission to candidature

(1) The Graduate Diploma in Engineering (Professional Engineering) is an entry program for the Master of Professional Engineering as part of a conversion Masters program. Available places will be offered to qualified applicants in the order in which complete applications are received, according to the following admissions criteria.
(2) Admission to the degree requires a Bachelor of Engineering degree or a Bachelor of Science degree or an equivalent qualification in a relevant discipline, from the University of Sydney or equivalent institution.
(3) In exceptional circumstances the Dean may admit applicants without these qualifications but whose evidence of experience and achievement is deemed by the Dean to be equivalent.

4 Requirements for award

(1) The units of study that are required to be taken for the course are determined by the Director of the Faculty of Engineering and Information Technologies School of Graduate Studies. These units of study will be prescribed in order to meet the assumed knowledge entry requirements of the Master of Professional Engineering.
(2) To qualify for the award of the graduate diploma a candidate must complete 48 credit points.

5 Credit for previous study

Candidates may apply for credit to a maximum of 18 credit points from prior learning.

6 Transitional provisions

(1) These resolutions apply to persons who commenced their candidature after 1 January, 2011 and persons 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.

Graduate Diploma in Computing

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended)and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HF041	Graduate Diploma in Computing

2 Attendance pattern

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

3 Admission to candidature

(1) Available places will be offered to qualified applicants based on merit, according to the following admissions criteria.
(2) Admission to candidature requires:
  (a) a bachelor's degree from the University of Sydney, or equivalent qualification, with a credit average or above, including units of study with a mathematical foundation demonstrating significant numeracy skills; or
  (b) a bachelor's degree from the University of Sydney, or equivalent qualification, with a credit average or above, and employment in the area of IT for a minimum of five years. Applicants must also provide evidence of prior learning which is considered to demonstrate the knowledge and aptitude required to undertake this course.

4 Requirements for award

(1) The units of study that may be taken for the course are set out in Table of units: Graduate Diploma in Computing.
(2) To qualify for the award of the Graduate Diploma in Computing, a candidate must complete 48 credit points.

5 Suspension of candidature

A student may suspend candidature in this course for a maximum of one year.

6 Cross-institutional study

Cross-institutional study is not available in this course except where the University of Sydney has a formal cooperation agreement with another university.

7 Credit for previous study

The credit transfer provisions of the Coursework Rule apply except that where the study has been undertaken at postgraduate level and no award has been conferred, credit to a maximum of 50% of the prescribed credit points may be transferred, provided:
  (a) the study has been undertaken at the University of Sydney, or at an external institution recognised by the University of Sydney, within the previous three years; and
  (b) the units are equivalent to units of study offered under the degree being taken, subject to approval of the Academic Director.

8 Satisfactory progress

The Dean may require any student who has failed a cumulative total of 18 credit points or more at any stage of enrolment in the Graduate Diploma in Computing to show good cause why he or she should be allowed to re-enrol.

9 Time limit

A candidate for the Graduate Diploma in Computing shall complete the requirements for the award in a minimum enrolment of two semesters and a maximum enrolment of eight semesters.

10 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 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.

Graduate Certificate in Greenhouse Gas Mitigation

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 2000 (the 'Coursework Rule'), the Resolutions of the Faculty, the University of Sydney (Student Appeals against Academic Decisions) Rule 2006 (as amended)and the Academic Board policies on Academic Dishonesty and Plagiarism.

Course resolutions

1 Course codes

Code	Course title
HG007	Graduate Certificate in Greenhouse Gas Mitigation

2 Attendance pattern

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

3 Admission to candidature

(1) Available places will be offered to qualified applicants in the order in which complete applications are received, according to the following admissions criteria.

(2) Admission to the degree requires the Bachelor of Engineering degree or an equivalent qualification in a relevant discipline, from the University of Sydney or equivalent institution.

(3) In exceptional circumstances the Dean may admit applicants without these qualifications but whose evidence of experience and achievement is deemed by the Dean to be equivalent.

4 Requirements for award

(1) The units of study that may be taken for the course are set out in Table of postgraduate units of study.

(2) To qualify for the award of the graduate certificate a candidate must complete 24 credit points.

5 Transitional provisions

(1) These resolutions apply to persons who commenced their candidature after 1 January, 2011 and persons 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 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.

8. Postgraduate coursework degree programs.

The Faculty of Engineering and Information Technologies offers coursework degrees at master's, graduate diploma and graduate certificate level.

In the Schools of Aerospace, Mechanical and Mechatronic Engineering, Chemical and Biomolecular Engineering, Civil Engineering and Electrical and Information Engineering:

- Master of Engineering (ME)
- Master of Professional Engineering (MPE)
- Graduate Diploma in Engineering (Professional Engineering) (GradDipPE)
- Graduate Diploma in Engineering (GradDipE)
- Graduate Certificate in Engineering (GradCertE)

In the School of Information Technology:

- Master of Information Technology (MIT)
- Graduate Diploma in Information Technology (GDIT)
- Graduate Certificate in Information Technology (GCIT)
- Master of Information Technology Management (MITM)
- Graduate Diploma in Information Technology Management (GDITM)
- Graduate Certificate in Information Technology Management(GCITM)
- Graduate Diploma in Computing (GDC)

In the School of Civil Engineering:

- Master of Project Management (MPM)
- Graduate Diploma of Project Management (GDPM)
- Graduate Certificate in Project Management (GCPM)

Conversion Masters' Programs

The Faculty of Engineering and Information Technologies offers a three year Conversion Master's Program, consisting of a Graduate Diploma (Professional Engineering) or Graduate Certificate in Engineering and the Master of Professional Engineering.

This program is aimed at students who have a non-Engineering background, such as an undergraduate degree in Science, or an overseas Engineering qualification. The complete three year program is designed so that students initially enrol in the foundation components of an Engineering stream, covering areas that were not part of their original undergraduate degree. This is done in the first year of enolment in a Graduate Certificate or Diploma.

Once the foundation subjects have been completed and entry requirements met, students can then go on to the Master of Professional Engineering degree. This two year degree covers the specialist and professional practice components of the selected Engineering stream.

Applicants for the Conversion Master's Program must satisfy the entry requirements set out in the tables for the Master or Professional Engineering for each stream.

Where students have completed the required entry subjects in a prior Bachelor's degree, advanced standing of up to one year may be awarded toward the program. Every application is assessed individually and an enrolment program is devised for each student to make sure that all students reach an equivalent level of theoretical, practical, professional and specialisation skills prior to commencement of the MPE.

Students must fulfill the entry requirements as follows:

1. Minimum Entry condition.
Must have completed a minimum of 48 credit points, or equivalent, of Science related units of study in their Bachelor's degree relevant to the Engineering stream chosen;

2. Foundation Subjects.
2.1 Must have completed 48 credit points of foundation engineering units of study in their Bachelor's degree relating to the field of engineering they wish to specialise in; or

2.2 must complete 48 credit points of foundation engineering units of study in a Graduate Diploma or Graduate Certificate in Engineering at the University of Sydney.

The complete Conversion Master's Program consists of 144 credit points, and 3.0 years duration of full-time study or equivalent in part-time study.

As a requirement of the Conversion Master's Program, students complete a capstone project, which may either be a 24 credit point research dissertation or a 12 credit point research project. Students will work with an academic supervisor on a current research - or industry based - project and write a thesis on their research outcomes. Students at the Master's level will develop the experience and professional skills required to critically evaluate the research undertaken while working on their capstone project.

Industrial experience done as a 12 week work placement, or equivalent, is a requirement for completion of the Master of Professional Engineering degree.

The MPE degree is available in the following specialisations:

in the School of Aerospace, Mechanical and Mechatronic Engineering

Aerospace, Biomedical and Mechanical Engineering

in the School of Chemical and Biomolecular Engineering

Chemical and Biomolecular Engineering

in the School of Civil Engineering

Civil, Environmental Fluids, Geotechnical and Structural Engineering

in the School of Electrical and Information Engineering

Electrical, Network, Power, Software and Wireless Engineering.

Coursework degree tables

Detailed unit of study tables listing all program requirements for the faculty postgraduate courses are shown in the following sections of this chapter.

8.1 School of Aerospace, Mechanical and Mechatronic Engineering

Master of Engineering specialisations

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
School of Aerospace, Mechanical and Mechatronic Engineering			
The School of Aerospace, Mechanical and Mechatronic Engineering offers the ME degree in the following specialisations. 1. ME (Mechanical) 2. ME (Aerospace) 3. ME (Biomedical) The requirements for these ME specialisations are shown in the following tables.			
Master of Engineering (Mechanical)			
Candidates must complete a total of 36 credit points from the specialist tables below.			
Specialist Units			
AMME5202 **Advanced Computational Fluid Dynamics**	6	**A** Partial differential equations; Finite difference methods;Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills.	Semester 1
AMME5101 **Power Plant Engineering**	6		Semester 1
AMME5271 **Computational Nanotechnology**	6	**A** Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required.	Semester 2
AMME5602 **Product Life Cycle Design**	6	**A** Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful.	Semester 2
AMME5912 **Crash Analysis using LS-DYNA**	6	**A** Computer Aided Drafting, Basic FEA principles and Solid Mechanics	Semester 1
AMME5921 **Biomedical Engineering Tech 2**	6	**A** A bachelors degree, ideally in the engineering or science field, is advisory, but not essential.	Semester 2
AMME5961 **Biomaterials Engineering**	6	**A** Chemistry, biology, materials engineering, and engineering design at least at the Junior level.	Semester 2
AMME5971 **Applied Tissue Engineering**	6	**A** Biology, chemistry at a junior level and intermediate physiology or equivalent	Semester 2
AMME5981 **Computational Biomedical Engineering**	6	**A** Fundamental Materials, Mechanics of Solids, Engineering Dynamics, Biomedical Design and Technology.	Semester 1
AMME5990 **Biomedical Engineering Tech 1**	6	**A** Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level.	Semester 1
AERO5200 **Advanced Aerodynamics**	6	**A** BE in the area of Aerospace Engineering or related Engineering field. *Note: Department permission required for enrolment*	Semester 1
AERO5301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field.	Semester 1
AERO5400 **Advanced Aircraft Design Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field.	Semester 2
AERO5500 **Flight Mechanics Test and Evaluation Adv**	6	**A** BE in area of Aerospace Engineering or related Engineering Field. **P** AERO5510	Semester 2
AERO5760 **Spacecraft and Satellite Design**	6	**A** BE in Aerospace Engineering or Equivalent.	Semester 2
MECH5255 **Air Conditioning and Refrigeration (Adv)**	6	**A** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **N** MECH4255	Semester 2
MECH5265 **Advanced Combustion**	6	**P** MECH5262 **N** MECH4265	Semester 2
MECH5275 **Advanced Renewable Energy**	6	**A** The students will require an understanding of the basic principles of fluid mechanics, thermodynamics and heat transfer, and the application of these principles to energy conversion systems. In particular, students should be able to analyse fluid flow in turbomachinery; perform first and second law thermodynamic analysis of energy conversion systems; and perform calculations of radiative, conductive and convective heat transfer.	Semester 2
MECH5305 **Smart Materials**	6	**A** Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics	Semester 2
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
MECH5416 **Advanced Design and Analysis**	6	**A** Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components	Semester 1
MECH5701 **Computers in Real Time Control and Inst**	6	**N** MECH4730, MECH4710	Semester 1
MECH5720 **Sensors and Signals**	6	**A** Strong MATLAB skills **N** MECH4720	Semester 1
MTRX5700 **Experimental Robotics**	6	**A** Undergraduate degree level assumed knowledge in Mechatronic Engineering. **N** MTRX4700	Semester 1
Professional Pathway Units			
1. Candidates must complete 12 credit points from the following table of professional pathway units.			
2. Additional specialist units or elective units from the postgraduate tables may be taken if these units have already been completed.			
AERO5660 **Safety Systems Management**	6		Semester 1
AMME5601 **Professional Engineering**	6	**A** Manufacturing, management experience or equivalent. Equivalent to AMME4100 Practical Experience, ENGG1803 Professional Engineering 1, MECH3661 Engineering Management	Semester 1
or Research Pathway Units			
1. School permission is required to complete this pathway.			
2. Admission to this pathway is determined by a candidate obtaining a distinction average (WAM of 75 or higher) in their first 24 credits of their ME studies.			
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Candidates may complete ENGG5219 in place of ENGG5220 AND ENGG5221.			
Master of Engineering (Aerospace)			
Candidates are required to complete 36 credit points of specialist core units and specialist elective units.			
Specialist Core Units			
Candidates must complete 24 credit points of specialist core units from the following table.			
AERO5301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field.	Semester 1
AERO5200 **Advanced Aerodynamics**	6	**A** BE in the area of Aerospace Engineering or related Engineering field. *Note: Department permission required for enrolment*	Semester 1
AERO5400 **Advanced Aircraft Design Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field.	Semester 2
AERO5500 **Flight Mechanics Test and Evaluation Adv**	6	**A** BE in area of Aerospace Engineering or related Engineering Field. **P** AERO5510	Semester 2
Specialist Elective Units			
An additional 12 credit points of specialist elective units of study must be chosen from the following list.			
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field.	Semester 2
AERO5660 **Safety Systems Management**	6		Semester 1
AERO5760 **Spacecraft and Satellite Design**	6	**A** BE in Aerospace Engineering or Equivalent.	Semester 2
AMME5202 **Advanced Computational Fluid Dynamics**	6	**A** Partial differential equations; Finite difference methods;Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills.	Semester 1
MECH5304 **Materials Failure**	6	**A** Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics *An elective unit of study for the degree of Master of Engineering*	Semester 2
MECH5305 **Smart Materials**	6	**A** Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics	Semester 2
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310	Semester 1
MECH5720 **Sensors and Signals**	6	**A** Strong MATLAB skills **N** MECH4720	Semester 1
Professional Pathway Units			
Candidates must complete the following units or complete the Research Pathway.			
AERO5901 **Project 1 and Seminar in Aerospace Eng**	6	**A** BE in area of Aerospace Engineering or related Engineering fields. *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*
AERO5902 **Project 2 and Seminar in Aerospace Eng**	6	**A** BE in area of Aerospace Engineering or related Engineering field. **C** AERO5901 *Note: Department permission required for enrolment*	Semester 1 Semester 2
or Research Pathway Units			
1. School permission is required to complete this pathway.			
2. Admission to this pathway is determined by a candidate obtaining a distinction average (WAM of 75 or higher) in their first 24 credits of their ME studies.			
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Candidates may complete ENGG5219 in place of ENGG5220 AND ENGG5221.			
Master of Engineering (Biomedical)			
Candidates are required to complete 36 credit points of specialist core units and specialist elective units.			
Specialist Core Units			
Candidates must complete 24 credit points of specialist core units from the following table.			
AMME5921 **Biomedical Engineering Tech 2**	6	**A** A bachelors degree, ideally in the engineering or science field, is advisory, but not essential.	Semester 2
AMME5961 **Biomaterials Engineering**	6	**A** Chemistry, biology, materials engineering, and engineering design at least at the Junior level.	Semester 2
AMME5981 **Computational Biomedical Engineering**	6	**A** Fundamental Materials, Mechanics of Solids, Engineering Dynamics, Biomedical Design and Technology.	Semester 1
AMME5990 **Biomedical Engineering Tech 1**	6	**A** Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level.	Semester 1
Specialist Elective Units			
An additional 12 credit points of specialist elective units of study must be chosen from the following list.			
AMME5202 **Advanced Computational Fluid Dynamics**	6	**A** Partial differential equations; Finite difference methods;Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills.	Semester 1
AMME5971 **Applied Tissue Engineering**	6	**A** Biology, chemistry at a junior level and intermediate physiology or equivalent	Semester 2
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310	Semester 1
AMME5602 **Product Life Cycle Design**	6	**A** Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful.	Semester 2
Professional Pathway Units			
1. Candidates must complete 12 credit points of professional pathway units offered from the table below.			
2. Additional specialist units or elective units from the postgraduate tables may be taken if these units have already been completed.			
AERO5660 **Safety Systems Management**	6		Semester 1
AMME5601 **Professional Engineering**	6	**A** Manufacturing, management experience or equivalent. Equivalent to AMME4100 Practical Experience, ENGG1803 Professional Engineering 1, MECH3661 Engineering Management	Semester 1
or Research Pathway Units			
1. School permission is required to complete this pathway			
2. Admission to this pathway is determined by obtaining a distinction (WAM 75 or higher) average in the first 24 credits of their ME studies.			
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Candidates may complete ENGG5219 in place of ENGG5220 AND ENGG5221.			

8.2 School of Chemical and Biomolecular Engineering

Master of Engineering specialisations

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
School of Chemical and Biomolecular Engineering			
The School of Chemical and Biomolecular Engineering offers the ME in the following specialisations. 1. Master of Engineering (Environmental) 2. Master of Engineering (Biophysical Processes) 3. Master of Engineering (Sustainable Processing) 4. Master of Engineering (Chemical and Biomolecular) 5. To qualify for a specialisation in Chemical and Biomolecular, Biophysical Processes, Environmental or Sustainable Processing, 12 credit points of relevant specialist units must be completed.			
Fundamental Units Candidates in all streams are required to complete 12 credit points of fundamental units of study from the table below or as determined by the Director of the ME program.			
CHNG5001 **Process Systems Engineering**	6	**A** Mathematics, physics and modeling. Assumed knowledge at the bachelor of Science level. *This unit of study is for Masters students and can be selected as an elective by 4th year students.*	Semester 2
CHNG5603 **Analysis, Modelling, Control: BioPhy Sys**	6	**A** It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling	Semester 1
CHNG5601 **Membrane Science**	6		Semester 1
Master of Engineering (Environmental)			
Specialist Units Candidates must complete 12 credit points from the following specialist units.			
CHNG5004 **Particles and Surfaces**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year or their equivalent have been successfully completed.	Semester 1
CHNG5005 **Wastewater Eng - Systems and Practice**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve 'real' chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources.	Semester 2
CIVL5665 **Advanced Water Resources Management**	6	**A** Basic calculation skills and a knowledge of the application of spreadsheets to perform data manipulation and presentation.	Semester 2
Master of Engineering (Biophysical Processes)			
Specialist Units Candidates must complete 12 credit points from the following specialist units.			
CHNG5602 **Cellular Biophysics**	6		Semester 1
CHNG5604 **Membrane Science Laboratory**	6		Semester 2
CHNG5605 **Bio-Products: Laboratory to Marketplace**	6		Semester 2
Master of Engineering (Sustainable Processing)			
Specialist Units Candidates must complete 12 credit points from the following specialist units.			
CHNG5003 **Green Engineering**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year or their equivalent have been successfully completed.	Semester 2
CHNG5005 **Wastewater Eng - Systems and Practice**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve 'real' chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources.	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
Master of Engineering (Chemical and Biomolecular Engineering)			
Specialist Units			
Candidates must complete 12 credit points from the units listed in the above specialist unit tables. Other postgraduate units from the school of Chemical and Biomolecular Engineering may be approved by the Director of the ME Program as alternates to the above specialist units.			
Elective Units			
1. Candidates in all streams must complete 12 credit points of elective units. 2. Electives may be taken from fundamental units, specialist units, project management units or professional practice units of study listed in the postgraduate tables in the Faculty of Engineering and IT Handbook.			
Professional Pathway Units			
Candidates in all streams must complete 12 credit points of professional pathway units from the specialist units in the tables above.			
or Research Pathway Units			
1. School permission is required to complete this pathway. 2. Admission to this pathway is determined by obtaining a distinction (WAM 75 or higher) average in the first 24 credits of their ME studies.			
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Candidates may complete ENGG5219 in place of ENGG5220 AND ENGG5221.			

8.3 School of Civil Engineering

Master of Engineering specialisations

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
School of Civil Engineering			
The School of Civil Engineering offers the ME in the following specialisations. 1. Master of Engineering (Geotechnical) 2. Master of Engineering (Structural) 3. Master of Engineering (Environmental Fluids) 4. Master of Engineering (Civil) 5. To qualify for a Civil, Structural, Geotechnical, or Environmental Fluids specialisation, 12 credit points of the relevant Fundamental Units and 24 credits points of the relevant Specialist Units must be completed. Requirements for these specialisations are shown in the following tables.			
Master of Engineering (Structural)			
Fundamental Units (Structural) Candidates need to complete 12 credit points of fundamental units from the table below.			
CIVL5266 **Steel Structures - Stability**	6		Semester 1
CIVL5269 **Concrete Structures - Strength & Service**	6		Semester 2
CIVL5458 **Numerical Methods in Civil Engineering**	6	**A** BE or equivalent.	Semester 1
Specialist Units (Structural) Candidates must complete 24 credit points of specialist units from the table below.			
CIVL5257 **Concrete Structures: Prestressed**	6		Semester 1
CIVL5264 **Composite Steel-Concrete Structures**	6		Semester 2
CIVL5267 **Steel Structures - Advanced Design**	6		Semester 1
CIVL5268 **Structural Dynamics**	6		Semester 2
Master of Engineering (Geotechnical)			
Fundamental Units (Geotechnical) Candidates need to complete 12 credit points of fundamental units from the table below.			
CIVL5351 **Environmental Geotechnics**	6		Semester 1
CIVL5452 **Foundation Engineering**	6	**A** BE or equivalent.	Semester 2
CIVL5458 **Numerical Methods in Civil Engineering**	6	**A** BE or equivalent.	Semester 1
Specialist Units (Geotechnical) Candidates must complete 24 credit points of specialist units from the table below.			
CIVL5450 **Analysis and Design of Pile Foundations**	6	**A** BE or equivalent.	Semester 1
CIVL5451 **Computer Methods in Geotechnical Eng**	6	**A** BE or equivalent.	Semester 1
CIVL5454 **Rock Engineering**	6	**A** Undergraduate geology and soil mechanics.	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
CIVL5455 **Engineering Behaviour of Soils**	6	**A** BE or equivalent.	Semester 2
Master of Engineering (Environmental Fluids)			
Fundamental Units (Environmental Fluids)			
Candidates need to complete 12 credit points of fundamental units from the table below.			
CIVL5351 **Environmental Geotechnics**	6		Semester 1
CIVL5665 **Advanced Water Resources Management**	6	**A** Basic calculation skills and a knowledge of the application of spreadsheets to perform data manipulation and presentation.	Semester 2
CIVL5670 **Reservoir Stream & Coastal Eng**	6	*Note: Department permission required for enrolment*	Semester 1
AMME5202 **Advanced Computational Fluid Dynamics**	6	**A** Partial differential equations; Finite difference methods;Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills.	Semester 1
Specialist Units (Environmental Fluids)			
Candidates must complete 24 credit points of specialist units from the table below.			
CHNG5005 **Wastewater Eng - Systems and Practice**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve 'real' chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources.	Semester 2
CIVL5666 **Open Channel Flow & Hydraulic Structures**	6	**A** BE or equivalent.	Semester 1
CIVL5669 **Applied Fluid Engineering Computing**	6	**A** Understanding of fluid mechanics at the undergraduate level; Appreciation of fluid flow problems relevant to Civil and Environmental Engineering applications; Basic computer skills and some understanding of numerical methods.	Semester 2
CIVL5668 **Wind Engineering for Design-Fundamentals**	6	**A** BE or equivalent.	Semester 1
Master of Engineering (Civil)			
Fundamental Units (Civil)			
Candidates need to complete 12 credit points of fundamental units from the tables of fundamental units listed for the above or alternate units as advised by the ME Program Director.			
Specialist Units (Civil).			
Candidates must complete 24 credit points of units from the tables of specialist units listed above.			
Elective Units (all streams)			
1. Candidates may complete 12 credit points of elective units. 2. Electives may be taken from Fundamental Units, Specialist Units, Project Management Units or Professional Practice units of study listed in the Postgraduate Tables in the Faculty of Engineering and IT Handbook.			
or Research Pathway Units			
1. School permission is required to complete this pathway. 2. Admission to this pathway is determined by obtaining a distinction (WAM 75 or higher) average in the first 24 credits of their ME studies.			
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Candidates may complete ENGG5219 Engineering Project in place of ENGG5220 Engineering Project A AND ENGG5221 Engineering Project B.			

8.4 School of Electrical and Information Engineering

Master of Engineering specialisations.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
School of Electrical and Information Engineering			
The School of Electrical and Information Engineering offers the ME in the following specialisations. 1. Master of Engineering (Wireless Engineering) 2. Master of Enginering (Network Engineering) 3. Master of Engineering (Power Engineering) 4. Master of Engineering (Electrical Engineering) 5. To qualify for an Electrical, Wireless, Network or Power specialisation 36 credit points of the relevant Specialist units must be completed.			
Master of Engineering (Wireless Engineering)			
Specialist Units (Wireless) Candidates must complete 36 credit points of specialist units from the table below.			
ELEC5101 **Antennas and Propagation**	6	**N** ELEC5522	Semester 2
ELEC5403 **Radio Frequency Engineering**	6	**A** Students will be expected to be familiar with ELEC3404 - Electronic Circuit Design , ELEC3104 - Engineering Electromagnetics and the third year course in Circuit Design: ELEC3105 - Circuit Theory and Design. **N** ELEC5521	Semester 1
ELEC5507 **Error Control Coding**	6	**A** Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. **N** ELEC4503	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. **N** ELEC5504, ELEC4504	Semester 2
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. **N** ELEC5501	Semester 1
ELEC5510 **Satellite Communication Systems**	6	**A** Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3505 Communications and ELEC4505 Digital Communication Systems, is assumed. **N** ELEC5502	Semester 2
ELEC5515 **Gigabits Wireless Systems**	6	**A** This unit assumes a competence in fundamental communications theory on modulation and equalization, digital signal processing techniques on filtering and FFT/IFFT, error-control coding and linear algebra.	Semester 2
Master of Engineering (Network Engineering)			
Specialist Units (Network) Candidates must complete 36 credit points of specialist units from the table below.			
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **N** ELEC5504, ELEC4504	Semester 2
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. **N** ELEC5501	Semester 1
ELEC5512 **Optical Networks**	6	**A** ELEC3503 Introduction to Digital Communications **N** ELEC5506	Semester 2
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3607, ELEC3305, ELEC3506 and ELEC5508	Semester 2
ELEC5515 **Gigabits Wireless Systems**	6	**A** This unit assumes a competence in fundamental communications theory on modulation and equalization, digital signal processing techniques on filtering and FFT/IFFT, error-control coding and linear algebra.	Semester 2
ELEC5614 **Real Time Computing**	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). Ability to program in a high level language. **N** ELEC4602	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1
Master of Engineering (Power Engineering)			
Specialist Units (Power)			
Candidates must complete 36 credit points of specialist units from the table below.			
ELEC5203 **Topics in Power Engineering**	6	**A** (ELEC3201 Electrical Energy Systems or ELEC3203 Power Engineering) and (ELEC3202 Power Electronics and Drives or ELEC3204 Power Electronics and Drives).	Semester 1
ELEC5204 **Power Systems Analysis and Protection**	6	**A** The unit assumes basic knowledge of circuits, familiarity with basic mathematics, competence with basic circuit theory and an understanding of three phase systems, transformers, transmission lines and associated modeling and operation of such equipment. **N** ELEC4201	Semester 1
ELEC5205 **High Voltage Engineering**	6	**A** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals equivalent to ELEC3105 *Recommended: ELEC5204 Power Systems*	Semester 2
ELEC5206 **Sustainable Energy Systems**	6	**A** Following concepts are assumed knowledge for this unit of study: familiarity with transformers, ac power, capacitors and inductors, electric circuits such as three-phase circuits and circuits with switches, and basic electronic circuit theory.	Semester 2
ELEC5303 **Computer Control System Design**	6	**A** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **N** ELEC4301	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1
Master of Engineering (Electrical)			
Specialist Units (Electrical)			
Candidates must complete 36 credit points of specialist units from the tables of recommended elective units listed below.			
Elective Units (all streams)			
1. Candidates must complete 12 credit points of additional units not already taken as specialisation from the table of recommended elective units below.			
2. Candidates can replace the 12 credit of electives with the Research Pathway.			
Recommended Elective Units of Study			
ELEC5101 **Antennas and Propagation**	6	**N** ELEC5522	Semester 2
ELEC5203 **Topics in Power Engineering**	6	**A** (ELEC3201 Electrical Energy Systems or ELEC3203 Power Engineering) and (ELEC3202 Power Electronics and Drives or ELEC3204 Power Electronics and Drives).	Semester 1
ELEC5204 **Power Systems Analysis and Protection**	6	**A** The unit assumes basic knowledge of circuits, familiarity with basic mathematics, competence with basic circuit theory and an understanding of three phase systems, transformers, transmission lines and associated modeling and operation of such equipment. **N** ELEC4201	Semester 1
ELEC5205 **High Voltage Engineering**	6	**A** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals equivalent to ELEC3105 *Recommended: ELEC5204 Power Systems*	Semester 2
ELEC5206 **Sustainable Energy Systems**	6	**A** Following concepts are assumed knowledge for this unit of study: familiarity with transformers, ac power, capacitors and inductors, electric circuits such as three-phase circuits and circuits with switches, and basic electronic circuit theory.	Semester 2
ELEC5303 **Computer Control System Design**	6	**A** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **N** ELEC4301	Semester 1
ELEC5402 **Digital Integrated Circuit Design**	6	**A** Electronic circuit design and physics of electronic devices. **N** ELEC4402	Semester 1
ELEC5403 **Radio Frequency Engineering**	6	**A** Students will be expected to be familiar with ELEC3404 - Electronic Circuit Design , ELEC3104 - Engineering Electromagnetics and the third year course in Circuit Design: ELEC3105 - Circuit Theory and Design. **N** ELEC5521	Semester 1
ELEC5507 **Error Control Coding**	6	**A** Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. **N** ELEC4503	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. **N** ELEC5504, ELEC4504	Semester 2
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. **N** ELEC5501	Semester 1
ELEC5510 **Satellite Communication Systems**	6	**A** Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3505 Communications and ELEC4505 Digital Communication Systems, is assumed. **N** ELEC5502	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** (ELEC3503 Introduction to Digital Communications or ELEC3505 Communications) and (ELEC3402 Communications Electronics or ELEC3405 Communications Electronics and Photonics) or equivalent	Semester 1
ELEC5512 **Optical Networks**	6	**A** ELEC3503 Introduction to Digital Communications **N** ELEC5506	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3607, ELEC3305, ELEC3506 and ELEC5508	Semester 2
ELEC5515 **Gigabits Wireless Systems**	6	**A** This unit assumes a competence in fundamental communications theory on modulation and equalization, digital signal processing techniques on filtering and FFT/IFFT, error-control coding and linear algebra.	Semester 2
ELEC5613 **Image Processing and Computer Vision**	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) or ELEC2602 Digital System Design (or ELEC3601 Digital Systems Design or ELEC3608 Digital Systems Design) or ELEC3603 Introduction to Computing Systems. *Note: Department permission required for enrolment*	Semester 1
ELEC5614 **Real Time Computing**	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). Ability to program in a high level language. **N** ELEC4602	Semester 1
ELEC5615 **Advanced Computer Architecture**	6	**A** Equivalent to ELEC4605 Computer Engineering or ELEC4601 Computer Design. *Note: Department permission required for enrolment*	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1
ELEC5618 **Software Quality Engineering**	6	**N** SOFT3302	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
ELEC5701 **Technology Venture Creation**	6	**N** ENGG4003	Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** ELEC3506 or equivalent	Semester 2
COMP5426 **Parallel and Distributed Computing**	6	**A** Equivalent of COMP5116	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Networking concepts, operating system concepts, programming expertise. **N** NETS4047	Semester 2
or Research Pathway Units 1. School permission is required to complete this pathway. 2. Admission to this pathway is determined by obtaining a distinction(WAM 75 or higher) average in the first 24 credits of their ME studies.			
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Candidates can complete ENGG5219 Engineering Project in place of ENGG5220 Engineering Project A AND ENGG5221 Engineering Project B.			

8.5 School of Information Technologies

The School of Information Technologies offers the postgraduate degree programs outlined in the table below.

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
School of Information Technology			
Master of Information Technology			
Core and elective units of study for the Master of Information Technology, Diploma in Information Technology and Graduate Certificate in Information Technology as shown in the following tables.			
Candidates for the degree of Master of Information Technology are required to complete 48 credit points from the units of study set out below, and complete a defined major.			
Enrolment is subject to the following constraints:			
1. A total of 48 credit points must be completed			
2. A maximum of 24 credit points can be selected from foundational units of study			
3. At least 24 credit points should come from specialist units of study or IT project units of study			
4. Every student must complete a defined major in the Master of Information Technology, which requires them to complete at least 18 credit points of core units in the designated major and INFO5990			
5. After completing 24 credit points of course work, students who achieve Credit average results or above in their coursework may select 12 credit points of IT project units of study among their specialist units			
6. After completing 24 credit points of course work, students who have Distinction average results or above may be eligible for the research path subject to the approval of the Head of the School of Information Technologies and the Dean			
7. Students who pursue the research path must study INFO5993 and select 18 credit points from IT research project units of study			
8. A maximum of 18 credit points may be selected with the approval of the Program Director, from units outside the Schol of IT, of which no more than 12 credits may be from outside the Faculty of Engineering and IT.			
Foundational units			
COMP5028 **Object-Oriented Design**	6	**A** Intermediate level of object oriented programming such as Java **N** INFO3220 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
COMP5114 **Digital Media Fundamentals**	6		Semester 1 Semester 2
COMP5116 **Internet Protocols**	6	**N** ELEC5740	Semester 1 Semester 2
COMP5138 **Database Management Systems**	6	**A** Intermediate level of object oriented programming such as Java.	Semester 1 Semester 2
COMP5206 **Introduction to Information Systems**	6	**N** INFO5210	Semester 1 Semester 2
COMP5211 **Algorithms**	6		Semester 1 Semester 2
COMP5214 **Software Development in Java**	6	*Note: Department permission required for enrolment in the following sessions: Semester 1*	Semester 1 Semester 2
INFO5001 **System Analysis and Modelling**	6	**A** Experience with a data model as in COMP5212 or COMP5214 or COMP5028 or COMP5138 **N** INFO2110, ELEC3610 and ELEC5743	Semester 2
Specialist units			
COMP5045 **Computational Geometry**	6	**A** Data structures, analysis of algorithms **N** COMP4045	Semester 1
COMP5046 **Statistical Natural Language Processing**	6	**A** Concepts of Linguistics, elementary statistics, AI techniques. **N** COMP4046	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Networking concepts, operating system concepts, programming expertise. **N** NETS4047	Semester 2
COMP5048 **Information Visualisation**	6	**A** Discrete mathematics, algorithms and complexity. **N** COMP4048	Semester 2
COMP5318 **Knowledge Discovery and Data Mining**	6	**A** COMP5138 and familiarity with basic statistics *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
COMP5338 **Advanced Data Models**	6	**A** COMP5138 or equivalent	Semester 2
COMP5347 **e-Commerce Technology**	6	**A** COMP5028 Object Oriented Analysis and Design	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
COMP5348 Enterprise Scale Software Architecture	6	**A** INFO3220 or COMP5028 or equivalent.	Semester 1
COMP5415 Multimedia Authoring and Production	6		Semester 2
COMP5416 Advanced Network Technologies	6	**A** ELEC3506 or equivalent	Semester 2
COMP5424 Information Technology in Biomedicine	6	**A** Basic programming skills	Semester 1
COMP5425 Multimedia Storage, Retrieval & Delivery	6	**A** Algorithms (equivalent to COMP5211).	Semester 1
COMP5426 Parallel and Distributed Computing	6	**A** Equivalent of COMP5116	Semester 1
COMP5456 Computational Methods for Life Sciences	6	**N** COMP3456	Semester 2
COMP5703 Information Technology Project	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
COMP5705 Information Technology Short Project	6	**N** COMP5702, COMP5704 *Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Main Winter Main
COMP5706 IT Industry Placement Project	6	**N** COMP5702, COMP5703, COMP5704 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC5303 Computer Control System Design	6	**A** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **N** ELEC4301	Semester 1
ELEC5402 Digital Integrated Circuit Design	6	**A** Electronic circuit design and physics of electronic devices. **N** ELEC4402	Semester 1
ELEC5507 Error Control Coding	6	**A** Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. **N** ELEC4503	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. **N** ELEC5504, ELEC4504	Semester 2
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. **N** ELEC5501	Semester 1
ELEC5510 Satellite Communication Systems	6	**A** Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3505 Communications and ELEC4505 Digital Communication Systems, is assumed. **N** ELEC5502	Semester 2
ELEC5511 Optical Communication Systems	6	**A** (ELEC3503 Introduction to Digital Communications or ELEC3505 Communications) and (ELEC3402 Communications Electronics or ELEC3405 Communications Electronics and Photonics) or equivalent	Semester 1
ELEC5512 Optical Networks	6	**A** ELEC3503 Introduction to Digital Communications **N** ELEC5506	Semester 2
ELEC5613 Image Processing and Computer Vision	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) or ELEC2602 Digital System Design (or ELEC3601 Digital Systems Design or ELEC3608 Digital Systems Design) or ELEC3603 Introduction to Computing Systems. *Note: Department permission required for enrolment*	Semester 1
ELEC5614 Real Time Computing	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). Ability to program in a high level language. **N** ELEC4602	Semester 1
ELEC5615 Advanced Computer Architecture	6	**A** Equivalent to ELEC4605 Computer Engineering or ELEC4601 Computer Design. *Note: Department permission required for enrolment*	Semester 1
ELEC5616 Computer and Network Security	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1
ELEC5619 Object Oriented Application Frameworks	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
HIMT5058 Health Informatics Applications	6		Semester 1
HIMT5060 Integration for Health Informatics	6		Semester 2
HIMT5069 Health Care Systems	6	*Note: Department permission required for enrolment in the following sessions: Semester 1*	Semester 1 Semester 2
INFO5010 IT Advanced Topic A	6	**P** Permission of Head of School **N** INFO4010 *Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Late
INFO5011 IT Advanced Topic B	6	**P** Permission of Head of School **N** INFO4011 *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO5301 Information Security Management	6	**A** Basic IT knowledge of databases and networks.	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
INFO5990 **Professional Practice in IT**	6		Semester 1 Semester 2
INFO5991 **Services Science Management and Eng**	6	**A** INFO5990	Semester 1 Semester 2
INFO6007 **Project Management in IT**	6	**A** INFS6000 or COMP5206 or INFO5990 **N** INFS6014, PMGT5871	Semester 1 Semester 2
INFS6012 **Business Process Integration**	6	**A** INFS5000 or INFS6001	Semester 1
INFS6017 **Strategic Information & Knowledge Mgmt**	6	**A** INFS5000 or INFS6001	Semester 2
PMGT6867 **Quantitative Methods: Project Management**	6		Semester 1 Semester 2

Research path units

COMP5702 **IT Research Project A**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
COMP5704 **IT Research Project B**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO5993 **IT Research Methods**	6	**A** Elementary statistics **N** INFO4990 *Note: Department permission required for enrolment*	Semester 1 Semester 2

Majors for the Master of Information Technology

Computer Networks major

To achieve a major in Computer Networks, a student must complete INFO5990 and 18 credit points of study units from this list.

Students in the Research Path must complete INFO5993 instead of INFO5990.

COMP5047 **Pervasive Computing**	6	**A** Networking concepts, operating system concepts, programming expertise. **N** NETS4047	Semester 2
COMP5116 **Internet Protocols**	6	**N** ELEC5740	Semester 1 Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** ELEC3506 or equivalent	Semester 2
COMP5426 **Parallel and Distributed Computing**	6	**A** Equivalent of COMP5116	Semester 1
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
Research path units of study COMP5702, COMP5704			
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. **N** ELEC5501	Semester 1

Multimedia Technology major

To achieve a major in Multimedia Technology, a student must complete INFO5990 and 18 credit points of study units from this list.

Students in the Research Path must complete INFO5993 instead of INFO5990.

COMP5114 **Digital Media Fundamentals**	6		Semester 1 Semester 2
COMP5415 **Multimedia Authoring and Production**	6		Semester 2
COMP5425 **Multimedia Storage, Retrieval & Delivery**	6	**A** Algorithms (equivalent to COMP5211).	Semester 1
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
Research Path units of study COMP5702, COMP5704			
ELEC5613 **Image Processing and Computer Vision**	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) or ELEC2602 Digital System Design (or ELEC3601 Digital Systems Design or ELEC3608 Digital Systems Design) or ELEC3603 Introduction to Computing Systems. *Note: Department permission required for enrolment*	Semester 1
One core unit of study from the Computer Science major (6 credit points) may also be included in the Multimedia Technology major.			

Database Management Systems major

To achieve a major in Database Management Systems, a student must complete INFO5990 and 18 credit points of study units from this list.

Students in the Research Path must complete INFO5993 instead of INFO5990.

COMP5046 **Statistical Natural Language Processing**	6	**A** Concepts of Linguistics, elementary statistics, AI techniques. **N** COMP4046	Semester 1
COMP5138 **Database Management Systems**	6	**A** Intermediate level of object oriented programming such as Java.	Semester 1 Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
COMP5318 **Knowledge Discovery and Data Mining**	6	**A** COMP5138 and familiarity with basic statistics *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
COMP5338 **Advanced Data Models**	6	**A** COMP5138 or equivalent	Semester 2
COMP5425 **Multimedia Storage, Retrieval & Delivery**	6	**A** Algorithms (equivalent to COMP5211).	Semester 1
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
Research Path units of study COMP5702, COMP5704			
Software Engineering major			
To achieve a major in Software Engineering, a student must complete INFO5990 and 18 credit points of study units from this list. Students may count either COMP5028 or COMP5214 or INFO5110 towards this major, but not more than one of these foundational units. Students in the Research Path must complete INFO5993 instead of INFO5990.			
COMP5028 **Object-Oriented Design**	6	**A** Intermediate level of object oriented programming such as Java **N** INFO3220 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
COMP5214 **Software Development in Java**	6	*Note: Department permission required for enrolment in the following sessions: Semester 1*	Semester 1 Semester 2
COMP5347 **e-Commerce Technology**	6	**A** COMP5028 Object Oriented Analysis and Design	Semester 1
COMP5348 **Enterprise Scale Software Architecture**	6	**A** INFO3220 or COMP5028 or equivalent.	Semester 1
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
Research path units of study COMP5702, COMP5704			
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
INFO5001 **System Analysis and Modelling**	6	**A** Experience with a data model as in COMP5212 or COMP5214 or COMP5028 or COMP5138 **N** INFO2110, ELEC3610 and ELEC5743	Semester 2
One core unit of study from the Computer Science major (6 credit points) may also be included in the Software Engineering major.			
Computer Science major			
To achieve a major in Computer Science, a student must complete INFO5990 and 18 credit points of study units from this list. Students in the Research Path must complete INFO5993 instead of INFO5990.			
COMP5045 **Computational Geometry**	6	**A** Data structures, analysis of algorithms **N** COMP4045	Semester 1
COMP5046 **Statistical Natural Language Processing**	6	**A** Concepts of Linguistics, elementary statistics, AI techniques. **N** COMP4046	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Networking concepts, operating system concepts, programming expertise. **N** NETS4047	Semester 2
COMP5048 **Information Visualisation**	6	**A** Discrete mathematics, algorithms and complexity. **N** COMP4048	Semester 2
COMP5211 **Algorithms**	6		Semester 1 Semester 2
COMP5456 **Computational Methods for Life Sciences**	6	**N** COMP3456	Semester 2
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
Research path units of study COMP5702, COMP5704			
Telecommunications Engineering major			
To achieve a major in Telecommunications Engineering, a student must complete INFO5990 and 18 credit points of study units from this list. A maximum of 18 credit points of ELEC units of study can be completed in this major. Students in the Research Path must complete INFO5993 instead of INFO5990.			
COMP5116 **Internet Protocols**	6	**N** ELEC5740	Semester 1 Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** ELEC3506 or equivalent	Semester 2
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
Research path units of study COMP5702, COMP5704			
ELEC5507 **Error Control Coding**	6	**A** Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. **N** ELEC4503	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **N** ELEC5504, ELEC4504	Semester 2
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. **N** ELEC5501	Semester 1
ELEC5510 **Satellite Communication Systems**	6	**A** Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3505 Communications and ELEC4505 Digital Communication Systems, is assumed. **N** ELEC5502	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** (ELEC3503 Introduction to Digital Communications or ELEC3505 Communications) and (ELEC3402 Communications Electronics or ELEC3405 Communications Electronics and Photonics) or equivalent	Semester 1
ELEC5512 **Optical Networks**	6	**A** ELEC3503 Introduction to Digital Communications **N** ELEC5506	Semester 2
Computer Engineering major			
To achieve a major in Computer Engineering, a student must complete INFO5990 and 18 credit points of study units from this list. A maximum of 18 credit points of ELEC units of study can be completed. Students in the Research Path must complete INFO5993 instead of INFO5990.			
COMP5116 **Internet Protocols**	6	**N** ELEC5740	Semester 1 Semester 2
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
Research Path units of study COMP5702, COMP5704			
ELEC5303 **Computer Control System Design**	6	**A** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **N** ELEC4301	Semester 1
ELEC5402 **Digital Integrated Circuit Design**	6	**A** Electronic circuit design and physics of electronic devices. **N** ELEC4402	Semester 1
ELEC5614 **Real Time Computing**	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). Ability to program in a high level language. **N** ELEC4602	Semester 1
ELEC5615 **Advanced Computer Architecture**	6	**A** Equivalent to ELEC4605 Computer Engineering or ELEC4601 Computer Design. *Note: Department permission required for enrolment*	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1
Business Information Systems major			
To achieve a major in Business Information Systems a student must complete INFO5990 18 credit points of study units from this list, including COMP5206. Students in the Research Path must complete INFO5993 instead of INFO5990.			
COMP5206 **Introduction to Information Systems**	6	**N** INFO5210	Semester 1 Semester 2
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
Research path units of study COMP5702, COMP5704			
INFO5301 **Information Security Management**	6	**A** Basic IT knowledge of databases and networks.	Semester 1
INFO5991 **Services Science Management and Eng**	6	**A** INFO5990	Semester 1 Semester 2
INFS6012 **Business Process Integration**	6	**A** INFS5000 or INFS6001	Semester 1
INFS6017 **Strategic Information & Knowledge Mgmt**	6	**A** INFS5000 or INFS6001	Semester 2
Project Management major			
To achieve a major in Project Management, a student must complete INFO5990 and 18 credit points of study units from this list, including INFO6007. Students in the Research Path must complete INFO5993 instead of INFO5990.			
COMP5348 **Enterprise Scale Software Architecture**	6	**A** INFO3220 or COMP5028 or equivalent.	Semester 1
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
Research path units of study COMP5702, COMP5704			
INFO5001 **System Analysis and Modelling**	6	**A** Experience with a data model as in COMP5212 or COMP5214 or COMP5028 or COMP5138 **N** INFO2110, ELEC3610 and ELEC5743	Semester 2
INFO5991 **Services Science Management and Eng**	6	**A** INFO5990	Semester 1 Semester 2
INFO6007 **Project Management in IT**	6	**A** INFS6000 or COMP5206 or INFO5990 **N** INFS6014, PMGT5871	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PMGT6867 **Quantitative Methods: Project Management**	6		Semester 1 Semester 2
Health Informatics major			
To achieve a major in Health Informatics, a student must complete INFO5990 and 18 credit points of study units from this list, including HIMT5057 or COMP5424. A maximum of 12 credit points of HMIT-coded units of study can be completed in this major. Students in the Research Path must complete INFO5993 instead of INFO5990.			
COMP5046 **Statistical Natural Language Processing**	6	**A** Concepts of Linguistics, elementary statistics, AI techniques. **N** COMP4046	Semester 1
COMP5206 **Introduction to Information Systems**	6	**N** INFO5210	Semester 1 Semester 2
COMP5424 **Information Technology in Biomedicine**	6	**A** Basic programming skills	Semester 1
COMP5456 **Computational Methods for Life Sciences**	6	**N** COMP3456	Semester 2
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
Research path units of study COMP 5702, COMP5704			
HIMT5058 **Health Informatics Applications**	6		Semester 1
HIMT5060 **Integration for Health Informatics**	6		Semester 2
HIMT5069 **Health Care Systems**	6	*Note: Department permission required for enrolment in the following sessions: Semester 1*	Semester 1 Semester 2
INFO6007 **Project Management in IT**	6	**A** INFS6000 or COMP5206 or INFO5990 **N** INFS6014, PMGT5871	Semester 1 Semester 2

Master of Information Technology Management

Core and elective units of study for the Master of Information Technology Management, Diploma in Information Technology Management and the Graduate Certificate in Information Technology Management are shown in the following Tables.

Candidates for the degree of Master of Information Technology Management are required to complete 48 credit points from the units of study set out below.

Enrolment is subject to the following constraints:

1. A total of 48 credit points must be completed;

2. At least 30 credit points must come from core units of study;

3. INFO5990 Professional Practice in IT must be completed as a core unit of study;

4. INFO5991 Services Science Managment and Eng must be completed as a core unit of study;

5. INFO5992 Understanding IT Innovations must be completed as a core unit of study;

6. A maximum of 18 credit points of elective units of study can be taken, of which no more than 12 credit points can be chosen from units offered outside the Faculty of Engineering and IT.

7. After completing 24 credit points of coursework, students who achieve Credit average results or above in their coursework may select 12 credit points of Information Technology Project units of study among their core units;

8. After completing 24 credit points of coursework, students who have Distinction average results or above may be eligible for the Research Path subject to the approval of the Head of the School of Information Technologies and the Dean. Students in the Research Path are not required to take INFO5991 or INFO5992.

Core units (mandatory)

INFO5990 **Professional Practice in IT**	6		Semester 1 Semester 2
INFO5991 **Services Science Management and Eng**	6	**A** INFO5990	Semester 1 Semester 2
INFO5992 **Understanding IT Innovations**	6	**A** INFO5990 **N** PMGT5875	Semester 1 Semester 2

Core units (additional)

COMP5206 **Introduction to Information Systems**	6	**N** INFO5210	Semester 1 Semester 2
COMP5703 **Information Technology Project**	12	*Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO5301 **Information Security Management**	6	**A** Basic IT knowledge of databases and networks.	Semester 1
INFO6007 **Project Management in IT**	6	**A** INFS6000 or COMP5206 or INFO5990 **N** INFS6014, PMGT5871	Semester 1 Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** Information systems concepts, database concepts **N** ISYS4050 *Note: Department permission required for enrolment*	Semester 1

Core units (research path)

COMP5702 **IT Research Project A**	12	*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*
COMP5704 **IT Research Project B**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO5993 **IT Research Methods**	6	**A** Elementary statistics **N** INFO4990 *Note: Department permission required for enrolment*	Semester 1 Semester 2
Elective units			
COMP5028 **Object-Oriented Design**	6	**A** Intermediate level of object oriented programming such as Java **N** INFO3220 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
COMP5114 **Digital Media Fundamentals**	6		Semester 1 Semester 2
COMP5116 **Internet Protocols**	6	**N** ELEC5740	Semester 1 Semester 2
COMP5138 **Database Management Systems**	6	**A** Intermediate level of object oriented programming such as Java.	Semester 1 Semester 2
COMP5213 **Computer and Network Organisation**	6		Semester 1 Semester 2
COMP5705 **Information Technology Short Project**	6	**N** COMP5702, COMP5704 *Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Main Winter Main
COMP5706 **IT Industry Placement Project**	6	**N** COMP5702, COMP5703, COMP5704 *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFS6012 **Business Process Integration**	6	**A** INFS5000 or INFS6001	Semester 1
INFS6013 **Information Risk, Governance & Assurance**	6	**A** INFS5000 or INFS6001	Semester 1
INFS6016 **Technology Enabled Business Innovation**	6	**A** INFS5000 or INFS6001	Semester 2
INFS6017 **Strategic Information & Knowledge Mgmt**	6	**A** INFS5000 or INFS6001	Semester 2
INFS6018 **Managing Business Intelligence**	6	**A** INFS5000 or INFS6001	Semester 1
PMGT5871 **Project Process Planning and Control**	6		Semester 1 Semester 2 Summer Early Winter Main
PMGT5876 **Strategic Delivery of Change**	6		Semester 1 Semester 2
PMGT6867 **Quantitative Methods: Project Management**	6		Semester 1 Semester 2
Graduate Diploma in Computing			
Candidates for the degree of Graduate Diploma in Computing are required to complete 48 credit points of the units of study set out below. Enrolment is subject to the following constraints: 1. 18 credit points must be completed before COMP5114 Digital Media Fundamentals can be taken; 2. 18 credit points must be completed before COMP5028 Object Oriented Design can be taken; 3. 18 credit points must be completed before COMP5116 Internet Protocols can be taken;			
COMP5028 **Object-Oriented Design**	6	**A** Intermediate level of object oriented programming such as Java **N** INFO3220 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
COMP5114 **Digital Media Fundamentals**	6		Semester 1 Semester 2
COMP5116 **Internet Protocols**	6	**N** ELEC5740	Semester 1 Semester 2
COMP5206 **Introduction to Information Systems**	6	**N** INFO5210	Semester 1 Semester 2
COMP5211 **Algorithms**	6		Semester 1 Semester 2
COMP5212 **Software Construction**	6		Semester 1
COMP5213 **Computer and Network Organisation**	6		Semester 1 Semester 2
COMP5214 **Software Development in Java**	6	*Note: Department permission required for enrolment in the following sessions: Semester 1*	Semester 1 Semester 2

8.6 School of Civil Engineering (Project Management Group)

The School of Civil Engineering offers the following graduate programs in Project Management.

Master of Project Management
Graduate Diploma in Project Management
Graduate Certificate in Project Management

These programs are available on-campus (check session details) and online (internet-based) delivery

The requirements of each program are shown in the following tables.

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Master of Project Management			
Candidates for the degree of Master of Project Management shall complete units of study totalling 48cpts chosen from units of study approved by the Faculty, of which 12cpts are Foundation, 12cpts Specialisation, 12cpts of Electives and 12cpts of Pathway units. Candidates for the Graduate Diploma in Project Management shall complete units of study totalling 36cpts chosen from units of study approved by the Faculty, of which 12cpts are Foundation, 12cpts Specialisation, 6cpts of Electives and 6cpts of Professional Practice units. Candidates for the Graduate Certificate in Project Management shall complete units of study totalling 24cpts chosen from units of study approved by the Faculty, of which 12cpts are Foundation, 6cpts Specialisation, 6cpts of Electives or 6cpts of Professional Practice units. For students admitted to the Graduate Diploma, after completing the requirements above, may proceed to the Master of Project Management by achieving Credit average results or above. Students admitted to the Master of Project Management may take the professional practice pathway or the research practice pathway. It is mandatory for all Master's students to complete PMGT5872. The Master of Project Management can be taken as a generic degree or with specialisations in Project Economics and Scheduling Management, International Project Management, Project Risk Management, or Strategic Project Management Implementation.			
Foundation units for Master, Graduate Diploma and Graduate Certficate in Project Management			
Candidates for Grad Cert, Grad Dip and Master of Project Management must complete at least 12 credit points from the foundation units of study listed.			
PMGT5886 **System Dynamics Modelling for PM**	6		Semester 1 Semester 2
PMGT5887 **Computer Applications in PM**	6		Semester 1 Semester 2
PMGT5877 **Management of Project Organisations**	6		Semester 1 Semester 2
PMGT5871 **Project Process Planning and Control**	6		Semester 1 Semester 2 Summer Early Winter Main
Specialisations for the Master of Project Management			
Candidates wishing to have a specialisation within the Master of Project Management will take 12 credit points of units of study from one of the tables listed below. Candidates must complete one of the core units.			
Project Economics and Scheduling Management			
Candidates wishing to specialise in Project Economics and Scheduling Management must complete a minimum of 12 credit points from the Table below, including a core unit.			
PMGT5873 **Project Economics and Finance** Core unit of study for this specialisation	6		Semester 1 Semester 2
PMGT5889 **Integrated Cost and Scheduling Control** Core unit of study for this specialisation	6		Semester 1 Semester 2
PMGT6867 **Quantitative Methods: Project Management**	6		Semester 1 Semester 2
PMGT5893 **Statistical Methods in PM**	6		Semester 2
International Project Management			
Candidates wishing to specialise in International Project Management need to complete a minimum of 12 credit points from the Table below, including the core unit.			
PMGT5888 **Global Project Management** Core unit of study for this specialisation	6		Semester 1 Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ENGG5215 **International Eng Strategy & Operations**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
PMGT6867 **Quantitative Methods: Project Management**	6		Semester 1 Semester 2
PMGT5893 **Statistical Methods in PM**	6		Semester 2
Project Risk Management Candidates wishing to specialise in Project Risk Management must complete a minimum of 12 credit points from the Table below, including the core unit.			
PMGT5891 **Project Risk Management** Core unit of study for this specialisation	6		Semester 1 Semester 2
ENGG5203 **Quality Engineering and Management**	6		Semester 2
PMGT5893 **Statistical Methods in PM**	6		Semester 2
PMGT6867 **Quantitative Methods: Project Management**	6		Semester 1 Semester 2
Strategic Project Management Implementation Candidates wishing to specialise in Strategic Project Management Implementation must complete a minimum of 12 credit points from the Table below, including the core unit.			
PMGT5876 **Strategic Delivery of Change** Core unit of study for this specialisation	6		Semester 1 Semester 2
PMGT6867 **Quantitative Methods: Project Management**	6		Semester 1 Semester 2
PMGT5879 **Strategic Portfolio & Program Management**	6		Semester 1 Semester 2
PMGT5875 **Project Innovation Management**	6		Semester 1 Semester 2 Summer Late
Professional Practice Pathway Candidates must complete 12 credit points from the units of study in the following Table. PMGT5872 is mandatory for Masters students.			
ENGG5205 **Professional Practice in PM**	6	**A** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.	Semester 1 Semester 2
PMGT5872 **People and Leadership**	6		Semester 1 Semester 2
PMGT6869 **Advanced Knowledge in Project Management**	6	**A** PMBoK Guide	Semester 1 Semester 2
PMGT5876 **Strategic Delivery of Change**	6		Semester 1 Semester 2
PMGT5879 **Strategic Portfolio & Program Management**	6		Semester 1 Semester 2
Research Practice Pathway			
PMGT5892 **Project Management Industrial Project**	12	*Note: Department permission required for enrolment* *Students must have a credit average for admission into this unit.*	Semester 1 Semester 2

8.7 Master of Professional Engineering

The Faculty of Engineering and Information Technologies offers the following specialist programs,

1. Master of Professional Engineering
2. Graduate Diploma in Engineering (Professional Engineering)

The Master of Professional Engineering is available in the following specialisations,

Aerospace

Biomedical

Chemical and Biomolecular

Civil

Electrical

Environmental Fluids

Geotechnical

Mechanical

Networking

Power

Software

Structural

Wireless

The requirements of these specialisations are shown in the following tables.

The Graduate Diploma in Engineering (Professional Engineering) is an entry pathway for MPE. Units of study required to complete this pathway will be subject to the recommendations of the Director of the individual MPE specialist programs.

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
# Master of Professional Engineering (Aerospace)			
Candidates for the degree Master of Professional Engineering in Aerospace Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be elligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
## Aerospace Core Units of Study			
### First Year			
AERO5210 **Foundations of Aerodynamics**	6	**A** Mathematics and Physics to the level of Bachelor of Science or equivalent. Linear Mathematics and Vector Calculus, Partial Differential Equations (Intro).	Semester 2
AERO5211 **Foundations of Propulsion Systems**	6	**A** Mathematics and Physics to a level of Bachelor of Science or equivalent.	Semester 2
AERO5310 **Foundations of Aerospace Structures**	6	**A** Mathematics and Physics to a level of Bachelor of Science or equivalent. Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series.	Semester 1
AERO5410 **Foundations of Aerospace Design**	6	**A** Mathematics, Physics and Solid Mechanics assumed knowledge at the level of Bachelor of Science or equivalent.	Semester 1
AERO5510 **Foundations of Flight Mechanics**	6	**A** Mathematics, Physics and Dynamics assumed knowledge at the level of Bachelor of Science or equivalent.	Semester 2
AERO5660 **Safety Systems Management**	6		Semester 1
AMME5501 **Foundations: System Dynamics and Control**	6	**A** AMME5500	Semester 1
### Second Year			
AERO5301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field.	Semester 1
AERO5400 **Advanced Aircraft Design Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field.	Semester 2
AMME5601 **Professional Engineering**	6	**A** Manufacturing, management experience or equivalent. Equivalent to AMME4100 Practical Experience, ENGG1803 Professional Engineering 1, MECH3661 Engineering Management	Semester 1
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Students who have achieved a WAM of 75% or higher in their first 48 credits of study are elligible for the Research Pathway and can replace ENGG5220, ENGG5221 with ENGG5222,ENGG5223, Engineering Dissertation A & B			
## Aerospace Elective Units of Study Candidates must complete 24 credit points from the following aerospace elective units.			
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field.	Semester 2
AERO5200 **Advanced Aerodynamics**	6	**A** BE in the area of Aerospace Engineering or related Engineering field. *Note: Department permission required for enrolment*	Semester 1
AERO5500 **Flight Mechanics Test and Evaluation Adv**	6	**A** BE in area of Aerospace Engineering or related Engineering Field. **P** AERO5510	Semester 2
AERO5760 **Spacecraft and Satellite Design**	6	**A** BE in Aerospace Engineering or Equivalent.	Semester 2
AMME5202 **Advanced Computational Fluid Dynamics**	6	**A** Partial differential equations; Finite difference methods;Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills.	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
MECH5305 **Smart Materials**	6	**A** Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics	Semester 2
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Biomedical)			
Candidates for the degree Master of Professional Engineering in Biomedical Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
Biomedical Core Units of Study			
First Year			
AMME5501 **Foundations: System Dynamics and Control**	6	**A** AMME5500	Semester 1
AMME5921 **Biomedical Engineering Tech 2**	6	**A** A bachelors degree, ideally in the engineering or science field, is advisory, but not essential.	Semester 2
AMME5971 **Applied Tissue Engineering**	6	**A** Biology, chemistry at a junior level and intermediate physiology or equivalent	Semester 2
MECH5261 **Foundations of Fluid Mechanics**	6	**A** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series; AMME5200 **N** MECH3261	Semester 1
MECH5361 **Foundations of Mechanics of Solids 2**	6	**A** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **P** AMME5301 **N** MECH3361	Semester 2
MECH5362 **Foundations of Materials 2**	6	**A** Mechanics of solids: statics, stress, strain **P** AMME5302 **N** MECH3362	Semester 1
MECH5660 **Foundations of Manufacturing Engineering**	6	**A** AMME5200, AMME5301, AMME5302 **N** MECH3660	Semester 1
Second Year			
AERO5660 **Safety Systems Management**	6		Semester 1
AMME5601 **Professional Engineering**	6	**A** Manufacturing, management experience or equivalent. Equivalent to AMME4100 Practical Experience, ENGG1803 Professional Engineering 1, MECH3661 Engineering Management	Semester 1
AMME5981 **Computational Biomedical Engineering**	6	**A** Fundamental Materials, Mechanics of Solids, Engineering Dynamics, Biomedical Design and Technology.	Semester 1
AMME5990 **Biomedical Engineering Tech 1**	6	**A** Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level.	Semester 1
AMME5961 **Biomaterials Engineering**	6	**A** Chemistry, biology, materials engineering, and engineering design at least at the Junior level.	Semester 2
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Students who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220, ENGG5221 Engineering Project A and B and 12 credit points of elective units of study with ENGG5222, ENGG5223 Dissertation A and B or ENGG5218 Dissertation.			
Biomedical Elective Units of Study Candidates must complete 12 credit points from the following biomedical elective units.			
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field.	Semester 2
AERO5301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field.	Semester 1
AMME5202 **Advanced Computational Fluid Dynamics**	6	**A** Partial differential equations; Finite difference methods;Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills.	Semester 1
AMME5271 **Computational Nanotechnology**	6	**A** Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required.	Semester 2
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
MECH5304 **Materials Failure**	6	**A** Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics *An elective unit of study for the degree of Master of Engineering*	Semester 2
MECH5701 **Computers in Real Time Control and Inst**	6	**N** MECH4730, MECH4710	Semester 1
MECH5720 **Sensors and Signals**	6	**A** Strong MATLAB skills **N** MECH4720	Semester 1
MECH5275 **Advanced Renewable Energy**	6	**A** The students will require an understanding of the basic principles of fluid mechanics, thermodynamics and heat transfer, and the application of these principles to energy conversion systems. In particular, students should be able to analyse fluid flow in turbomachinery; perform first and second law thermodynamic analysis of energy conversion systems; and perform calculations of radiative, conductive and convective heat transfer.	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
MECH5255 **Air Conditioning and Refrigeration (Adv)**	6	**A** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **N** MECH4255	Semester 2
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310	Semester 1
MECH5416 **Advanced Design and Analysis**	6	**A** Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components	Semester 1
MTRX5700 **Experimental Robotics**	6	**A** Undergraduate degree level assumed knowledge in Mechatronic Engineering. **N** MTRX4700	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Chemical and Biomolecular)			
Candidates for the degree Master of Professional Engineering in Chemical and Biomolecular Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
Core Foundation Units of Study			
Students are required to complete a minimum of 36 credits of foundation units of study from the following list of units. The selection these units must be based on the advice from the Director of the Program to ensure coverage of background knowledge.			
CHNG5701 **Found of Conservation & Transport Proc**	6	**A** Calculus, computations (Matlab, Excel), Mass and Energy Balances **N** CHNG2801	Semester 1
CHNG5703 **Found of Energy and Fluid Systems**	6	**A** Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on qualitative and quantitative information **N** CHNG2803	Semester 1
CHNG5802 **Found: Operation & Improving Ind Systems**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **P** CHNG5701, CHNG5702, CHNG5704 and CHNG5705 **N** CHNG3802	Semester 1
CHNG5803 **Found of Chem & Biological Processes**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative and quantitative information **P** CHNG5701, CHNG5702, CHNG5704 and CHNG5705 **N** CHNG3803	Semester 1
CHNG5704 **Found: Chem & Biological Syst Behaviour**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. **N** CHNG2804	Semester 2
CHNG5801 **Foundations of Process Design**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **P** CHNG5701, CHNG5702, CHNG5704, CHNG5705 **N** CHNG3801	Semester 1
CHNG5804 **Found of Biochemical Eng**	6	**A** First year mathematics (MATH1001 Differential Calculus; MATH1002 Linear Algebra; MATH1003 Integral Calculus; MATH1005 Statistics; or equivalents). -First year chemistry (CHEM1101 Chemistry 1A; CHEM1102 Chemistry 1B; or equivalents) **N** CHNG3804	Semester 2
CHNG5805 **Foundation of Prod Formulation & Design**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **P** CHNG5701, CHNG5702, CHNG5704 and CHNG5705 **N** CHNG3805	Semester 2
CHNG5806 **Found of Manag of Industrial Syst**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **P** CHNG5701, CHNG5702, CHNG5704 and CHNG5705. **N** CHNG3806	Semester 2
Core Units of Study			
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
CHNG5112 **Found of Chemical Eng Design A**	6	**A** Enrolment in this unit of study assumes that all core chemical engineering UoS in second and third years, or their equivalent, have been successfully completed. **P** CHNG5801, CHNG5802, CHNG5805, CHNG5806	Semester 1 Semester 2
CHNG5116 **Found of Chemical Eng Design B**	6	**A** Enrolment in this unit of study assumes that all core chemical engineering UoS in second and third years, or their equivalent, have been successfully completed. **P** CHNG5112 Chemical Engineering Design A	Semester 1 Semester 2
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Candidates entering the program with an undergraduate chemical engineering degree who have achieved a minimum 75% average in their first 48 credit points of the MPE program will be permitted to replace ENGG5220 Engineering Project A, ENGG5221 Engineering Project B and 12 cr pts of elective units with ENGG5222 Dissertation A and ENGG5223 Dissertation B or ENGG5218 Dissertation.			
Elective Units of Study			
Candidates must complete a minimum of 6 credit points from the following list of Management elective units of study.			
ENGG5204 **Engineering Professional Practice**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
ENGG5216 **Management of Engineering Innovation**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
ENGG5205 **Professional Practice in PM**	6	**A** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.	Semester 1 Semester 2
ENGG5214 **Management of Technology**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5215 **International Eng Strategy & Operations**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
Candidates must complete a minimum of 24 credit points from the following list of specialist elective units of study or other electives recommended by the School of Chemical and Biomolecular Engineering.			
CHNG5004 **Particles and Surfaces**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year or their equivalent have been successfully completed.	Semester 1
CHNG5601 **Membrane Science**	6		Semester 1
CHNG5602 **Cellular Biophysics**	6		Semester 1
CHNG5603 **Analysis, Modelling, Control: BioPhy Sys**	6	**A** It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling	Semester 1
CIVL5665 **Advanced Water Resources Management**	6	**A** Basic calculation skills and a knowledge of the application of spreadsheets to perform data manipulation and presentation.	Semester 2
CHNG5003 **Green Engineering**	6	**A** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year or their equivalent have been successfully completed.	Semester 2
CHNG5005 **Wastewater Eng - Systems and Practice**	6	**A** Ability to conduct mass and energy balances, and the integration of these concepts to solve 'real' chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources.	Semester 2
CHNG5008 **Chemical & Biomolecular Engineering Adv**	6	**P** CHNG5801 *Note: Department permission required for enrolment*	Semester 2
CHNG5605 **Bio-Products: Laboratory to Marketplace**	6		Semester 2
CHNG5001 **Process Systems Engineering**	6	**A** Mathematics, physics and modeling. Assumed knowledge at the bachelor of Science level. *This unit of study is for Masters students and can be selected as an elective by 4th year students.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Civil)			
Candidates for the degree Master of Professional Engineering in Civil Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
Civil Core Units of Study			
First Year			
ENGG5204 **Engineering Professional Practice**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
ENGG5205 **Professional Practice in PM**	6	**A** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.	Semester 1 Semester 2
CIVL5507 **Foundations of Concrete Structures 1**	6	**A** CIVL5501, CIVL5502, CIVL5509. Stress-strain relationships for steel and concrete; concepts of force equilibrium, compatability of strains, and elastic beam theory. *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background*	Semester 1
CIVL5511 **Foundations of Fluid Mechanics**	6	**A** This unit of study assumes previous study of the fundamental principles of fluid dynamics obtained from CIVL5505 Foundations of Fluid Mechanics and Inviscid Flow or equivalent introductory fluid mechanics subject.	Semester 1
CIVL5512 **Foundation of Eng Design & Construction**	6	**A** Basic knowledge of construction operations including excavation, embankments and other earthworks, hauling and associated procedures - drilling and blasting, survey, reinforced concrete construction (including formwork and formwork substitutes), interpretation of engineering drawings.	Semester 1
CIVL5508 **Foundations of Steel Structures 1**	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL2230 Introduction to Structural Concepts and Design as well as knowledge of the content in CIVL3235 Structural Analysis. It is assumed that students are competent in the following areas: the methods of load transfer in structures tension, compression, bending, shear, torsion, and bearing; an appreciation of stress and strain, and being able to determine stresses and strains in simple sections under axial force, bending moments, shear and torsion; calculating and understanding the physical significance of geometric section properties : centroid, Ix, Iy, Zx, Zy, Sx, Sy, rx, ry, J, Ag; knowledge of the basic elastic-plastic material properties of steel, E, G, fy, fu; and knowledge of loading of structures. *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
Second Year			
CIVL5510 **Foundations of Civil Engineering Design**	6	**A** CIVL3205 and CIVL3206 or equivalent *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Students entering the MPE with an engineering undergraduate degree who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220, ENGG5221 Engineering Project A and B and 12 credit points of elective units of study with ENGG5222, ENGG5223 Dissertation A and B or ENGG5218 Dissertation.			
Recommended Elective Units of Study Candidates must complete 18 credit points from the following elective units of study.			
CIVL5266 **Steel Structures - Stability**	6		Semester 1
CIVL5268 **Structural Dynamics**	6		Semester 2
CIVL5269 **Concrete Structures - Strength & Service**	6		Semester 2
CIVL5351 **Environmental Geotechnics**	6		Semester 1
CIVL5452 **Foundation Engineering**	6	**A** BE or equivalent.	Semester 2
CIVL5458 **Numerical Methods in Civil Engineering**	6	**A** BE or equivalent.	Semester 1
CIVL5513 **Foundations of Structural Analysis**	6	**A** This unit of study assumes previous study of the fundamental principles of structural mechanics obtained from CIVL5502 Foundations of Structural Mechanics or equivalent introductory structural mechanics subject.	Semester 2
CIVL5514 **Foundations of Geotechnical Engineering**	6	**A** Fundamentals of soil mechanics including effective stress, pore pressure, consolidation and seepage.	Semester 2
CIVL5670 **Reservoir Stream & Coastal Eng**	6	*Note: Department permission required for enrolment*	Semester 1
Advanced Recommended Elective Units of Study Candidates must complete 24 credit points from the following advanced elective units of study.			

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
CIVL5257 Concrete Structures: Prestressed	6		Semester 1
CIVL5267 Steel Structures - Advanced Design	6		Semester 1
CIVL5268 Structural Dynamics	6		Semester 2
CIVL5450 Analysis and Design of Pile Foundations	6	**A** BE or equivalent.	Semester 1
CIVL5451 Computer Methods in Geotechnical Eng	6	**A** BE or equivalent.	Semester 1
CIVL5665 Advanced Water Resources Management	6	**A** Basic calculation skills and a knowledge of the application of spreadsheets to perform data manipulation and presentation.	Semester 2
CIVL5668 Wind Engineering for Design-Fundamentals	6	**A** BE or equivalent.	Semester 1
CIVL5264 Composite Steel-Concrete Structures	6		Semester 2
CIVL5455 Engineering Behaviour of Soils	6	**A** BE or equivalent.	Semester 2
CIVL5454 Rock Engineering	6	**A** Undergraduate geology and soil mechanics.	Semester 2
CIVL5666 Open Channel Flow & Hydraulic Structures	6	**A** BE or equivalent.	Semester 1
CIVL5669 Applied Fluid Engineering Computing	6	**A** Understanding of fluid mechanics at the undergraduate level; Appreciation of fluid flow problems relevant to Civil and Environmental Engineering applications; Basic computer skills and some understanding of numerical methods.	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
# Master of Professional Engineering (Electrical)			
Candidates for the degree of Master of Professional Engineering in Electrical Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
## Electrical Core Units of Study			
### First Year			
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
ENGG5204 **Engineering Professional Practice**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
At least 4 of the following 8 units of study:			
ELEC5730 **Foundations of Eng Electromagnetics**	6	**A** Differential calculus, integral calculus, vector integral calculus; electrical circuit theory and analysis using lumped elements; fundamental electromagnetic laws and their use in the calculation of static fields. **N** ELEC3102, ELEC3104 *This Unit of Study is only available to Master of Professional Engineering students with a Non-Electrical Engineering degree.*	Semester 1
ELEC5732 **Foundations of Electricity Networks**	6	**A** This unit of study assumes a competence in first year mathematics (in particular, the ability to work with complex numbers), in elementary circuit theory and in basic electromagnetics **N** ELEC3201, ELEC3203 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 2
ELEC5734 **Foundations Elec Energy & Conversion Sys**	6	**A** Following concepts are assumed knowledge for this unit of study: familiarity with circuit theory, electronic devices, ac power, capacitors and inductors, and electric circuits such as three-phase circuits and circuits with switches, the use of basic laboratory equipment such as oscilloscope and power supply. *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
ELEC5735 **Foundations of Control**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform. ELEC2302 and MATH2061 or equivalent. **N** ELEC3302, ELEC3304, AMME3500 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 2
ELEC5736 **Foundations of Digital Signal Processing**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, continuous linear time-invariant systems and their time and frequency domain representations, Fourier transform, sampling of continuous time signals **N** ELEC3303, ELEC3305 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
ELEC5737 **Foundations of Electronic Circuit Design**	6	**A** A background in basic electronics and circuit theory is assumed. **N** ELEC3401, ELEC3404 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
ELEC5739 **Foundations of Communications**	6	**A** Confidence in mathematical operation usually needed to handle telecommunications problems such as Fourier transform, fundamental in signals and systems theory, convolution, and similar techniques. **N** ELEC3503 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
ELEC5741 **Foundations of Embedded Computing**	6	**A** Logic operations, theorems and Boolean algebra, data representation, number operations (binary, hex, integers and floating point), combinational logic analysis and synthesis, sequential logic, registers, counters, bus systems, state machines, simple CAD tools for logic design, basic computer organisation, the CPU, peripheral devices, software organisation, machine language, assembly language, operating systems, data communications and computer networks. **N** ELEC2601 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
### Second Year			
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Students who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220, ENGG5221 Engineering Project A & B and the 12 credit points selection from the list of ENGG5214, ENGG5215 and ENGG5216 with ENGG5222 and ENGG5223 Dissertation A & B or ENGG5218 Dissertation.			
At least 2 of the following 5 units of study:			
ENGG5203 **Quality Engineering and Management**	6		Semester 2
ENGG5205 **Professional Practice in PM**	6	**A** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.	Semester 1 Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ENGG5214 Management of Technology	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5215 International Eng Strategy & Operations	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5216 Management of Engineering Innovation	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
Electrical Recommended Elective Units. Candidates must complete 36 credit points from the following table of elective units of study.			
ELEC5101 Antennas and Propagation	6	**N** ELEC5522	Semester 2
ELEC5203 Topics in Power Engineering	6	**A** (ELEC3201 Electrical Energy Systems or ELEC3203 Power Engineering) and (ELEC3202 Power Electronics and Drives or ELEC3204 Power Electronics and Drives).	Semester 1
ELEC5204 Power Systems Analysis and Protection	6	**A** The unit assumes basic knowledge of circuits, familiarity with basic mathematics, competence with basic circuit theory and an understanding of three phase systems, transformers, transmission lines and associated modeling and operation of such equipment. **N** ELEC4201	Semester 1
ELEC5205 High Voltage Engineering	6	**A** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals equivalent to ELEC3105 *Recommended: ELEC5204 Power Systems*	Semester 2
ELEC5206 Sustainable Energy Systems	6	**A** Following concepts are assumed knowledge for this unit of study: familiarity with transformers, ac power, capacitors and inductors, electric circuits such as three-phase circuits and circuits with switches, and basic electronic circuit theory.	Semester 2
ELEC5303 Computer Control System Design	6	**A** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **N** ELEC4301	Semester 1
ELEC5402 Digital Integrated Circuit Design	6	**A** Electronic circuit design and physics of electronic devices. **N** ELEC4402	Semester 1
ELEC5403 Radio Frequency Engineering	6	**A** Students will be expected to be familiar with ELEC3404 - Electronic Circuit Design , ELEC3104 - Engineering Electromagnetics and the third year course in Circuit Design: ELEC3105 - Circuit Theory and Design. **N** ELEC5521	Semester 1
ELEC5507 Error Control Coding	6	**A** Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. **N** ELEC4503	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. **N** ELEC5504, ELEC4504	Semester 2
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. **N** ELEC5501	Semester 1
ELEC5510 Satellite Communication Systems	6	**A** Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3505 Communications and ELEC4505 Digital Communication Systems, is assumed. **N** ELEC5502	Semester 2
ELEC5511 Optical Communication Systems	6	**A** (ELEC3503 Introduction to Digital Communications or ELEC3505 Communications) and (ELEC3402 Communications Electronics or ELEC3405 Communications Electronics and Photonics) or equivalent	Semester 1
ELEC5512 Optical Networks	6	**A** ELEC3503 Introduction to Digital Communications **N** ELEC5506	Semester 2
ELEC5514 Networked Embedded Systems	6	**A** ELEC3607, ELEC3305, ELEC3506 and ELEC5508	Semester 2
ELEC5515 Gigabits Wireless Systems	6	**A** This unit assumes a competence in fundamental communications theory on modulation and equalization, digital signal processing techniques on filtering and FFT/IFFT, error-control coding and linear algebra.	Semester 2
ELEC5613 Image Processing and Computer Vision	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) or ELEC2602 Digital System Design (or ELEC3601 Digital Systems Design or ELEC3608 Digital Systems Design) or ELEC3603 Introduction to Computing Systems. *Note: Department permission required for enrolment*	Semester 1
ELEC5614 Real Time Computing	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). Ability to program in a high level language. **N** ELEC4602	Semester 1
ELEC5615 Advanced Computer Architecture	6	**A** Equivalent to ELEC4605 Computer Engineering or ELEC4601 Computer Design. *Note: Department permission required for enrolment*	Semester 1
ELEC5616 Computer and Network Security	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Environmental Fluids)			
Candidates for the degree Master of Professional Engineering in Environmental Fluids Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
Core Units of Study			
First Year			
CIVL5507 **Foundations of Concrete Structures 1**	6	**A** CIVL5501, CIVL5502, CIVL5509. Stress-strain relationships for steel and concrete; concepts of force equilibrium, compatability of strains, and elastic beam theory. *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background*	Semester 1
CIVL5511 **Foundations of Fluid Mechanics**	6	**A** This unit of study assumes previous study of the fundamental principles of fluid dynamics obtained from CIVL5505 Foundations of Fluid Mechanics and Inviscid Flow or equivalent introductory fluid mechanics subject.	Semester 1
CIVL5512 **Foundation of Eng Design & Construction**	6	**A** Basic knowledge of construction operations including excavation, embankments and other earthworks, hauling and associated procedures - drilling and blasting, survey, reinforced concrete construction (including formwork and formwork substitutes), interpretation of engineering drawings.	Semester 1
CIVL5505 **Foundations of Intro. Fluid Mechanics**	6	**A** Students are expected to have a strong understanding of fundamental physics, statics, equilibrium, forces, and dimensional analysis. Familiarity with simple calculus, partial differential equations, and the analytical and numerical solutions. *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
CIVL5508 **Foundations of Steel Structures 1**	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL2230 Introduction to Structural Concepts and Design as well as knowledge of the content in CIVL3235 Structural Analysis. It is assumed that students are competent in the following areas: the methods of load transfer in structures tension, compression, bending, shear, torsion, and bearing; an appreciation of stress and strain, and being able to determine stresses and strains in simple sections under axial force, bending moments, shear and torsion; calculating and understanding the physical significance of geometric section properties : centroid, Ix, Iy, Zx, Zy, Sx, Sy, rx, ry, J, Ag; knowledge of the basic elastic-plastic material properties of steel, E, G, fy, fu; and knowledge of loading of structures. *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
ENGG5204 **Engineering Professional Practice**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
ENGG5205 **Professional Practice in PM**	6	**A** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.	Semester 1 Semester 2
CIVL5665 **Advanced Water Resources Management**	6	**A** Basic calculation skills and a knowledge of the application of spreadsheets to perform data manipulation and presentation.	Semester 2
Second Year			
CIVL5668 **Wind Engineering for Design-Fundamentals**	6	**A** BE or equivalent.	Semester 1
CIVL5666 **Open Channel Flow & Hydraulic Structures**	6	**A** BE or equivalent.	Semester 1
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
CIVL5510 **Foundations of Civil Engineering Design**	6	**A** CIVL3205 and CIVL3206 or equivalent *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
CIVL5669 **Applied Fluid Engineering Computing**	6	**A** Understanding of fluid mechanics at the undergraduate level; Appreciation of fluid flow problems relevant to Civil and Environmental Engineering applications; Basic computer skills and some understanding of numerical methods.	Semester 2
Students entering the MPE with an engineering undergraduate degree who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220, ENGG5221 Engineering Project A and B and 12 credit points of elective units of study with ENGG5222, ENGG5223 Dissertation A and B or ENGG5218 Dissertation.			
Specialist Recommended Elective Units of Study Candidates must complete 12 credit points from the following specialist elective units of study.			
CIVL5351 **Environmental Geotechnics**	6		Semester 1
AMME5202 **Advanced Computational Fluid Dynamics**	6	**A** Partial differential equations; Finite difference methods;Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills.	Semester 1
CIVL5670 **Reservoir Stream & Coastal Eng**	6	*Note: Department permission required for enrolment*	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Recommended Elective Units of Study			
Candidates must complete 6 credit points from the following civil elective units of study.			
CIVL5257 **Concrete Structures: Prestressed**	6		Semester 1
CIVL5264 **Composite Steel-Concrete Structures**	6		Semester 2
CIVL5267 **Steel Structures - Advanced Design**	6		Semester 1
CIVL5268 **Structural Dynamics**	6		Semester 2
CIVL5450 **Analysis and Design of Pile Foundations**	6	**A** BE or equivalent.	Semester 1
CIVL5451 **Computer Methods in Geotechnical Eng**	6	**A** BE or equivalent.	Semester 1
CIVL5454 **Rock Engineering**	6	**A** Undergraduate geology and soil mechanics.	Semester 2
CIVL5455 **Engineering Behaviour of Soils**	6	**A** BE or equivalent.	Semester 2
ENGG5601 **Greenhouse Gas Mitigation**	6	*Note: Department permission required for enrolment* *Unit Administration: WebCT*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Geotechnical)			
Candidates for the degree Master of Professional Engineering in Geotechnical Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
Core Units of Study			
First Year			
CIVL5507 **Foundations of Concrete Structures 1**	6	**A** CIVL5501, CIVL5502, CIVL5509. Stress-strain relationships for steel and concrete; concepts of force equilibrium, compatability of strains, and elastic beam theory. *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background*	Semester 1
CIVL5508 **Foundations of Steel Structures 1**	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL2230 Introduction to Structural Concepts and Design as well as knowledge of the content in CIVL3235 Structural Analysis. It is assumed that students are competent in the following areas: the methods of load transfer in structures tension, compression, bending, shear, torsion, and bearing; an appreciation of stress and strain, and being able to determine stresses and strains in simple sections under axial force, bending moments, shear and torsion; calculating and understanding the physical significance of geometric section properties : centroid, Ix, Iy, Zx, Zy, Sx, Sy, rx, ry, J, Ag; knowledge of the basic elastic-plastic material properties of steel, E, G, fy, fu; and knowledge of loading of structures. *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
CIVL5511 **Foundations of Fluid Mechanics**	6	**A** This unit of study assumes previous study of the fundamental principles of fluid dynamics obtained from CIVL5505 Foundations of Fluid Mechanics and Inviscid Flow or equivalent introductory fluid mechanics subject.	Semester 1
CIVL5512 **Foundation of Eng Design & Construction**	6	**A** Basic knowledge of construction operations including excavation, embankments and other earthworks, hauling and associated procedures - drilling and blasting, survey, reinforced concrete construction (including formwork and formwork substitutes), interpretation of engineering drawings.	Semester 1
ENGG5204 **Engineering Professional Practice**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
ENGG5205 **Professional Practice in PM**	6	**A** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.	Semester 1 Semester 2
CIVL5455 **Engineering Behaviour of Soils**	6	**A** BE or equivalent.	Semester 2
Second Year			
CIVL5450 **Analysis and Design of Pile Foundations**	6	**A** BE or equivalent.	Semester 1
CIVL5451 **Computer Methods in Geotechnical Eng**	6	**A** BE or equivalent.	Semester 1
CIVL5510 **Foundations of Civil Engineering Design**	6	**A** CIVL3205 and CIVL3206 or equivalent *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
CIVL5454 **Rock Engineering**	6	**A** Undergraduate geology and soil mechanics.	Semester 2
Students entering the MPE with an engineering undergraduate degree who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220, ENGG5221 Engineering Project A and B and 12 credit points of elective units of study with ENGG5222, ENGG5223 Dissertation A and B or ENGG5218 Dissertation.			
Recommended Specialist Elective Units of Study Candidates must complete 12 credit points from the following specialist elective units of study.			
CIVL5351 **Environmental Geotechnics**	6		Semester 1
CIVL5452 **Foundation Engineering**	6	**A** BE or equivalent.	Semester 2
CIVL5458 **Numerical Methods in Civil Engineering**	6	**A** BE or equivalent.	Semester 1
Recommended Elective Units of Study Candidates must complete 6 credit points from the following Civil elective units of study.			
CIVL5257 **Concrete Structures: Prestressed**	6		Semester 1
CIVL5264 **Composite Steel-Concrete Structures**	6		Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
CIVL5267 **Steel Structures - Advanced Design**	6		Semester 1
CIVL5268 **Structural Dynamics**	6		Semester 2
CIVL5665 **Advanced Water Resources Management**	6	**A** Basic calculation skills and a knowledge of the application of spreadsheets to perform data manipulation and presentation.	Semester 2
CIVL5666 **Open Channel Flow & Hydraulic Structures**	6	**A** BE or equivalent.	Semester 1
CIVL5668 **Wind Engineering for Design-Fundamentals**	6	**A** BE or equivalent.	Semester 1
CIVL5669 **Applied Fluid Engineering Computing**	6	**A** Understanding of fluid mechanics at the undergraduate level; Appreciation of fluid flow problems relevant to Civil and Environmental Engineering applications; Basic computer skills and some understanding of numerical methods.	Semester 2
CIVL5670 **Reservoir Stream & Coastal Eng**	6	*Note: Department permission required for enrolment*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
# Master of Professional Engineering (Mechanical)			
Candidates for the degree Master of Professional Engineering in Mechanical Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
## Mechanical Core Units of Study			
### First Year			
MECH5261 **Foundations of Fluid Mechanics**	6	**A** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series; AMME5200 **N** MECH3261	Semester 1
MECH5361 **Foundations of Mechanics of Solids 2**	6	**A** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **P** AMME5301 **N** MECH3361	Semester 2
AMME5501 **Foundations: System Dynamics and Control**	6	**A** AMME5500	Semester 1
MECH5660 **Foundations of Manufacturing Engineering**	6	**A** AMME5200, AMME5301, AMME5302 **N** MECH3660	Semester 1
MECH5362 **Foundations of Materials 2**	6	**A** Mechanics of solids: statics, stress, strain **P** AMME5302 **N** MECH3362	Semester 1
MECH5262 **Foundations of Thermal Engineering**	6	**A** Fundamentals of thermodynamics are needed to begin this more advanced course. **P** AMME5200 **N** MECH3260	Semester 2
### Second Year			
AERO5660 **Safety Systems Management**	6		Semester 1
AMME5601 **Professional Engineering**	6	**A** Manufacturing, management experience or equivalent. Equivalent to AMME4100 Practical Experience, ENGG1803 Professional Engineering 1, MECH3661 Engineering Management	Semester 1
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Students who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220, ENGG5221 Engineering Project A and B and 12 credit points of elective units of study with ENGG5222, ENGG5223 Dissertation A and B or ENGG5218 Dissertation.			
## Mechanical Elective Units of Study Candidates must complete 36 credit points from the following elective units of study.			
### Thermofluids			
AMME5101 **Power Plant Engineering**	6		Semester 1
AMME5202 **Advanced Computational Fluid Dynamics**	6	**A** Partial differential equations; Finite difference methods;Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills.	Semester 1
AMME5271 **Computational Nanotechnology**	6	**A** Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required.	Semester 2
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field.	Semester 2
MECH5255 **Air Conditioning and Refrigeration (Adv)**	6	**A** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **N** MECH4255	Semester 2
MECH5265 **Advanced Combustion**	6	**P** MECH5262 **N** MECH4265	Semester 2
MECH5275 **Advanced Renewable Energy**	6	**A** The students will require an understanding of the basic principles of fluid mechanics, thermodynamics and heat transfer, and the application of these principles to energy conversion systems. In particular, students should be able to analyse fluid flow in turbomachinery; perform first and second law thermodynamic analysis of energy conversion systems; and perform calculations of radiative, conductive and convective heat transfer.	Semester 2
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
### Materials			
MECH5304 **Materials Failure**	6	**A** Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics *An elective unit of study for the degree of Master of Engineering*	Semester 2
MECH5305 **Smart Materials**	6	**A** Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
MECH5416 **Advanced Design and Analysis**	6	**A** Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components	Semester 1
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310	Semester 1
AMME5271 **Computational Nanotechnology**	6	**A** Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required.	Semester 2
AMME5961 **Biomaterials Engineering**	6	**A** Chemistry, biology, materials engineering, and engineering design at least at the Junior level.	Semester 2
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
Design and Manufacturing			
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field.	Semester 2
AERO5301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field.	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
MECH5416 **Advanced Design and Analysis**	6	**A** Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components	Semester 1
AMME5602 **Product Life Cycle Design**	6	**A** Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful.	Semester 2
AMME5902 **Computer Aided Manufacturing**	6		Semester 2
AMME5912 **Crash Analysis using LS-DYNA**	6	**A** Computer Aided Drafting, Basic FEA principles and Solid Mechanics	Semester 1
Mechatronics			
MECH5416 **Advanced Design and Analysis**	6	**A** Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components	Semester 1
MECH5701 **Computers in Real Time Control and Inst**	6	**N** MECH4730, MECH4710	Semester 1
MECH5720 **Sensors and Signals**	6	**A** Strong MATLAB skills **N** MECH4720	Semester 1
MTRX5700 **Experimental Robotics**	6	**A** Undergraduate degree level assumed knowledge in Mechatronic Engineering. **N** MTRX4700	Semester 1
AERO5760 **Spacecraft and Satellite Design**	6	**A** BE in Aerospace Engineering or Equivalent.	Semester 2
AMME5602 **Product Life Cycle Design**	6	**A** Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful.	Semester 2
AMME5902 **Computer Aided Manufacturing**	6		Semester 2
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Network)			
Candidates for the degree of Master of Professional Engineering in Network Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
Network Core Units of Study			
First Year			
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
ENGG5204 **Engineering Professional Practice**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
ELEC5736 **Foundations of Digital Signal Processing**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, continuous linear time-invariant systems and their time and frequency domain representations, Fourier transform, sampling of continuous time signals **N** ELEC3303, ELEC3305 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
ELEC5739 **Foundations of Communications**	6	**A** Confidence in mathematical operation usually needed to handle telecommunications problems such as Fourier transform, fundamental in signals and systems theory, convolution, and similar techniques. **N** ELEC3503 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
ELEC5740 **Foundations of Data Comm & the Internet**	6	**N** ELEC3504, ELEC4501 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 2
ELEC5744 **Foundations of Digital Comm Systems**	6	**A** ELEC3505 Communications or equivalent **N** ELEC4502 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
Second Year			
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Students who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220, ENGG5221 Engineering Project A & B and the 12 credit points selection from the list of ENGG5214, ENGG5215 and ENGG5216 with ENGG5222 and ENGG5223 Dissertation A & B or ENGG5218 Dissertation.			
At least 2 of the following 5 units of study:			
ENGG5203 **Quality Engineering and Management**	6		Semester 2
ENGG5205 **Professional Practice in PM**	6	**A** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.	Semester 1 Semester 2
ENGG5214 **Management of Technology**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5215 **International Eng Strategy & Operations**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5216 **Management of Engineering Innovation**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
Network Recommended Elective Units. Candidates must complete 36 credit points from the following table of elective units of study.			
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **N** ELEC5504, ELEC4504	Semester 2
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. **N** ELEC5501	Semester 1
ELEC5512 **Optical Networks**	6	**A** ELEC3503 Introduction to Digital Communications **N** ELEC5506	Semester 2
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3607, ELEC3305, ELEC3506 and ELEC5508	Semester 2
ELEC5515 **Gigabits Wireless Systems**	6	**A** This unit assumes a competence in fundamental communications theory on modulation and equalization, digital signal processing techniques on filtering and FFT/IFFT, error-control coding and linear algebra.	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC5614 **Real Time Computing**	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). Ability to program in a high level language. **N** ELEC4602	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Power)			
Candidates for the degree of Master of Professional Engineering in Power Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing addition credit points of recommended eletive units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
Power Core Units of Study			
First Year			
ENGG5202 Sustainable Design, Eng and Mgt	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
ENGG5204 Engineering Professional Practice	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
ELEC5732 Foundations of Electricity Networks	6	**A** This unit of study assumes a competence in first year mathematics (in particular, the ability to work with complex numbers), in elementary circuit theory and in basic electromagnetics **N** ELEC3201, ELEC3203 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 2
ELEC5733 Foundations of Power Electronics & Apps	6	**A** Differential equations, linear algebra, complex variables, analysis of linear circuits. Fourier theory applied to periodic and non-periodic signals. Software such as MATLAB to perform signal analysis and filter design. Familiarity with the use of basic laboratory equipment such as oscilloscope, function generator, power supply, etc. **N** ELEC3202, ELEC3204 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
ELEC5734 Foundations Elec Energy & Conversion Sys	6	**A** Following concepts are assumed knowledge for this unit of study: familiarity with circuit theory, electronic devices, ac power, capacitors and inductors, and electric circuits such as three-phase circuits and circuits with switches, the use of basic laboratory equipment such as oscilloscope and power supply. *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
ELEC5735 Foundations of Control	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform. ELEC2302 and MATH2061 or equivalent. **N** ELEC3302, ELEC3304, AMME3500 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 2
Second Year			
ENGG5217 Industrial Placement		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 Engineering Project A	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 Engineering Project B	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Students who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220,ENGG5221 Engineering Project A & B and 12 credit points selectionfrom the list of ENGG5214, ENGG5215 and ENGG5216 with ENGG5222 and ENGG5223 Dissertation A & B or ENGG5218 Dissertation.			
At least 2 of the following 5 units of study:			
ENGG5203 Quality Engineering and Management	6		Semester 2
ENGG5205 Professional Practice in PM	6	**A** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.	Semester 1 Semester 2
ENGG5214 Management of Technology	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5215 International Eng Strategy & Operations	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5216 Management of Engineering Innovation	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
Power Recommended Elective Units.			
Candidates must complete 36 credit points from the following table of elective units of study.			
ELEC5203 Topics in Power Engineering	6	**A** (ELEC3201 Electrical Energy Systems or ELEC3203 Power Engineering) and (ELEC3202 Power Electronics and Drives or ELEC3204 Power Electronics and Drives).	Semester 1
ELEC5204 Power Systems Analysis and Protection	6	**A** The unit assumes basic knowledge of circuits, familiarity with basic mathematics, competence with basic circuit theory and an understanding of three phase systems, transformers, transmission lines and associated modeling and operation of such equipment. **N** ELEC4201	Semester 1
ELEC5205 High Voltage Engineering	6	**A** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals equivalent to ELEC3105 *Recommended: ELEC5204 Power Systems*	Semester 2
ELEC5206 Sustainable Energy Systems	6	**A** Following concepts are assumed knowledge for this unit of study: familiarity with transformers, ac power, capacitors and inductors, electric circuits such as three-phase circuits and circuits with switches, and basic electronic circuit theory.	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC5303 **Computer Control System Design**	6	**A** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **N** ELEC4301	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Software)			
Candidates for the degree of Master of Professional Engineering in Software Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
Software Core Units of Study			
First Year			
INFO5990 **Professional Practice in IT**	6		Semester 1 Semester 2
COMP5028 **Object-Oriented Design**	6	**A** Intermediate level of object oriented programming such as Java **N** INFO3220 *Note: Department permission required for enrolment in the following sessions: Semester 2*	Semester 1 Semester 2
COMP5615 **Software Engineering Project**	6	**P** INFO6007 **N** COMP3615 and INFO3600 *Note: Department permission required for enrolment*	Semester 2
ELEC5742 **Foundations: Internet Software Platforms**	6	**A** INFO1103, INFO2110 and INFO2120 or equivalent **N** EBUS4001 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 2
COMP5047 **Pervasive Computing**	6	**A** Networking concepts, operating system concepts, programming expertise. **N** NETS4047	Semester 2
COMP5348 **Enterprise Scale Software Architecture**	6	**A** INFO3220 or COMP5028 or equivalent.	Semester 1
Second Year			
ELEC5618 **Software Quality Engineering**	6	**N** SOFT3302	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
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Students who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220,ENGG5221 Engineering Project A & B and the 12 credit points selection from the list of ENGG5214, ENGG5215, ENGG5216 and INFO6007 with ENGG5222 and ENGG5223 Dissertation A & B or ENGG5218 Dissertation.			
At least 2 of the following 4 units of study:			
ENGG5214 **Management of Technology**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5215 **International Eng Strategy & Operations**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5216 **Management of Engineering Innovation**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
INFO6007 **Project Management in IT**	6	**A** INFS6000 or COMP5206 or INFO5990 **N** INFS6014, PMGT5871	Semester 1 Semester 2
Software Recommended Elective Units. Candidates must complete 18 credit points from the following table of elective units of study.			
COMP5338 **Advanced Data Models**	6	**A** COMP5138 or equivalent	Semester 2
COMP5426 **Parallel and Distributed Computing**	6	**A** Equivalent of COMP5116	Semester 1
ELEC5613 **Image Processing and Computer Vision**	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) or ELEC2602 Digital System Design (or ELEC3601 Digital Systems Design or ELEC3608 Digital Systems Design) or ELEC3603 Introduction to Computing Systems. *Note: Department permission required for enrolment*	Semester 1
ELEC5614 **Real Time Computing**	6	**A** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). Ability to program in a high level language. **N** ELEC4602	Semester 1
ELEC5615 **Advanced Computer Architecture**	6	**A** Equivalent to ELEC4605 Computer Engineering or ELEC4601 Computer Design. *Note: Department permission required for enrolment*	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths. **N** ELEC5611, NETS3016, NETS3916	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Structural)			
Candidates for the degree Master of Professional Engineering in Structural Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
Core Units of Study			
First Year			
ENGG5204 Engineering Professional Practice	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
ENGG5205 Professional Practice in PM	6	**A** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.	Semester 1 Semester 2
CIVL5507 Foundations of Concrete Structures 1	6	**A** CIVL5501, CIVL5502, CIVL5509. Stress-strain relationships for steel and concrete; concepts of force equilibrium, compatability of strains, and elastic beam theory. *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background*	Semester 1
CIVL5511 Foundations of Fluid Mechanics	6	**A** This unit of study assumes previous study of the fundamental principles of fluid dynamics obtained from CIVL5505 Foundations of Fluid Mechanics and Inviscid Flow or equivalent introductory fluid mechanics subject.	Semester 1
CIVL5508 Foundations of Steel Structures 1	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL2230 Introduction to Structural Concepts and Design as well as knowledge of the content in CIVL3235 Structural Analysis. It is assumed that students are competent in the following areas: the methods of load transfer in structures tension, compression, bending, shear, torsion, and bearing; an appreciation of stress and strain, and being able to determine stresses and strains in simple sections under axial force, bending moments, shear and torsion; calculating and understanding the physical significance of geometric section properties : centroid, Ix, Iy, Zx, Zy, Sx, Sy, rx, ry, J, Ag; knowledge of the basic elastic-plastic material properties of steel, E, G, fy, fu; and knowledge of loading of structures. *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
CIVL5512 Foundation of Eng Design & Construction	6	**A** Basic knowledge of construction operations including excavation, embankments and other earthworks, hauling and associated procedures - drilling and blasting, survey, reinforced concrete construction (including formwork and formwork substitutes), interpretation of engineering drawings.	Semester 1
CIVL5268 Structural Dynamics	6		Semester 2
Second Year			
ENGG5217 Industrial Placement		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
CIVL5510 Foundations of Civil Engineering Design	6	**A** CIVL3205 and CIVL3206 or equivalent *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
ENGG5220 Engineering Project A	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 Engineering Project B	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
CIVL5257 Concrete Structures: Prestressed	6		Semester 1
CIVL5267 Steel Structures - Advanced Design	6		Semester 1
CIVL5264 Composite Steel-Concrete Structures	6		Semester 2
Students entering the MPE with an engineering undergraduate degree who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220, ENGG5221 Engineering Project A and B and 12 credit points of elective units of study with ENGG5222, ENGG5223 Dissertation A and B or ENGG5218 Dissertation.			
Specialist Elective Units of Study Candidates must complete 12 credit points from the following specialist elective units of study.			
CIVL5266 Steel Structures - Stability	6		Semester 1
CIVL5269 Concrete Structures - Strength & Service	6		Semester 2
CIVL5458 Numerical Methods in Civil Engineering	6	**A** BE or equivalent.	Semester 1
Recommended Elective Units of Study Candidates must complete 6 credit points from the following Civil elective units of study.			
CIVL5450 Analysis and Design of Pile Foundations	6	**A** BE or equivalent.	Semester 1
CIVL5451 Computer Methods in Geotechnical Eng	6	**A** BE or equivalent.	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
CIVL5454 Rock Engineering	6	**A** Undergraduate geology and soil mechanics.	Semester 2
CIVL5455 Engineering Behaviour of Soils	6	**A** BE or equivalent.	Semester 2
CIVL5665 Advanced Water Resources Management	6	**A** Basic calculation skills and a knowledge of the application of spreadsheets to perform data manipulation and presentation.	Semester 2
CIVL5666 Open Channel Flow & Hydraulic Structures	6	**A** BE or equivalent.	Semester 1
CIVL5668 Wind Engineering for Design-Fundamentals	6	**A** BE or equivalent.	Semester 1
CIVL5669 Applied Fluid Engineering Computing	6	**A** Understanding of fluid mechanics at the undergraduate level; Appreciation of fluid flow problems relevant to Civil and Environmental Engineering applications; Basic computer skills and some understanding of numerical methods.	Semester 2
CIVL5670 Reservoir Stream & Coastal Eng	6	*Note: Department permission required for enrolment*	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
# Master of Professional Engineering (Wireless)			
Candidates for the degree of Master of Professional Engineering in Wireless Engineering are required to gain credit for the core units of study set out below. Additional credit necessary shall be gained by completing additional credit points of recommended elective units as shown in the elective table below. To be eligible for the award of the degree students must gain credit for a total of not less than 96 credit points.			
## Wireless Core Units of Study			
### First Year			
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline.	Semester 1
ENGG5204 **Engineering Professional Practice**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
ELEC5736 **Foundations of Digital Signal Processing**	6	**A** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, continuous linear time-invariant systems and their time and frequency domain representations, Fourier transform, sampling of continuous time signals **N** ELEC3303, ELEC3305 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
ELEC5739 **Foundations of Communications**	6	**A** Confidence in mathematical operation usually needed to handle telecommunications problems such as Fourier transform, fundamental in signals and systems theory, convolution, and similar techniques. **N** ELEC3503 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
ELEC5740 **Foundations of Data Comm & the Internet**	6	**N** ELEC3504, ELEC4501 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 2
ELEC5744 **Foundations of Digital Comm Systems**	6	**A** ELEC3505 Communications or equivalent **N** ELEC4502 *This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.*	Semester 1
### Second Year			
ENGG5217 **Industrial Placement**		**P** Students will have completed a minimum of 48cp towards the MPE.	Semester 1 Semester 2
ENGG5220 **Engineering Project A**	6	**P** 48 credits from MPE degree program **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219 *Note: Department permission required for enrolment*	Semester 1 Semester 2
ENGG5221 **Engineering Project B**	6	**C** ENGG5220 **N** ENGG5222, ENGG5223, ENGG5218, ENGG5219	Semester 1 Semester 2
Students who have achieved a WAM of 75% or higher in their first 48 credits of study are eligible for the Research Pathway and can replace ENGG5220, ENGG5221 Engineering Project A & B and the 12 credit points selection from the list of ENGG5214, ENGG5215 and ENGG5216 with ENGG5222 and ENGG5223 Dissertation A & B or ENGG5218 Dissertation.			
At least 2 of the following 5 units of study:			
ENGG5203 **Quality Engineering and Management**	6		Semester 2
ENGG5205 **Professional Practice in PM**	6	**A** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.	Semester 1 Semester 2
ENGG5214 **Management of Technology**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5215 **International Eng Strategy & Operations**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 2
ENGG5216 **Management of Engineering Innovation**	6	**A** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience.	Semester 1
## Wireless Recommended Elective Units.			
Candidates must complete 36 credit points from the following table of elective units of study.			
ELEC5101 **Antennas and Propagation**	6	**N** ELEC5522	Semester 2
ELEC5403 **Radio Frequency Engineering**	6	**A** Students will be expected to be familiar with ELEC3404 - Electronic Circuit Design , ELEC3104 - Engineering Electromagnetics and the third year course in Circuit Design: ELEC3105 - Circuit Theory and Design. **N** ELEC5521	Semester 1
ELEC5507 **Error Control Coding**	6	**A** Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. **N** ELEC4503	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. **N** ELEC5504, ELEC4504	Semester 2
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. **N** ELEC5501	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC5510 **Satellite Communication Systems**	6	**A** Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3505 Communications and ELEC4505 Digital Communication Systems, is assumed. **N** ELEC5502	Semester 2
ELEC5515 **Gigabits Wireless Systems**	6	**A** This unit assumes a competence in fundamental communications theory on modulation and equalization, digital signal processing techniques on filtering and FFT/IFFT, error-control coding and linear algebra.	Semester 2

9. Postgraduate units of study

Engineering and Information Technologies postgraduate units of study

Complete unit of study descriptions giving details of assessment, learning outcomes, graduate attribute mappings and semester schedule are published on the Faculty of Engineering and Information Technologies course information web site : http://cusp.sydney.edu.au/engineering/

School of Aerospace, Mechanical and Mechatronic Engineering

AERO5010
Optimisation Methods in Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project work - own time. **Assumed knowledge:** BE in the area of Aerospace or related Engineering field. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit is intended primarily to graduate students and senior undergraduate students with some background in linear algebra, and with basic knowledge of FORTRAN, C++ or Matlab. After completion of this unit, students will have a much deeper understanding of methods used in modern design optimisation for linear and non-linear problems. Such problems are becoming increasingly common and important in engineering and scientific work. The unit will explore the limitations, advantages and caveats associated with optimisation in engineering applications. Students will develop their own optimisation methods for linear, non-linear, and multi-objective computational and experimental applications.

AERO5200
Advanced Aerodynamics

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Assumed knowledge:** BE in the area of Aerospace Engineering or related Engineering field. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Objectives/Expected Outcomes: To develop a specialist knowledge in the fields of computational, non-linear and unsteady aerodynamics. Syllabus Summary: Introduction to transonic flows and application to design of aircraft components. Elements of Hypersonic flow; real gas effects Boundary layer in compressible flow and shock - boundary layer interaction. ; flutter and divergence. Solution of aerospace flow problems using finite volume methods. Unsteady supersonic one-dimensional flow. Hypersonic flow. Introduction to the use of CFD for transonic flow. Rarefied gas dynamics. Direct simulation method (DSMC); near-continuum solutions. Simulation techniques for numerical solutions of non-linear continuum flow.

AERO5210
Foundations of Aerodynamics

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures, 3hr per week, 2hr Tut/Lab/Demo per week and three 3 hour Laboratory sessions per semester **Assumed knowledge:** Mathematics and Physics to the level of Bachelor of Science or equivalent. Linear Mathematics and Vector Calculus, Partial Differential Equations (Intro). **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop in students a knowledge of the complex behaviour of airflow in the case of two dimensional aerofoil sections and three dimensional wings. To encourage hands-on experimentation with wind-tunnel tests to allow an understanding of these concepts and their range of applicability. At the end of this unit students will be able to: predict flow properties for general aircraft wing sections to obtain lift, drag and pitching moment; extrapolate section results to predict full three dimensional wing behaviour; undertake experiments and analyse data to verify theoretical predictions; construct simple computer algorithms that will allow more complex geometries to be solved; understand the limitations of theory and the effect of second order parameters (Reynolds number, Mach Number) to the primary flow properties. Course content will include: construction and designation of two dimensional aerofoil sections; point vortex model of aerofoil; Joukowski transformation theory; thin aerofoil theory; linear lift properties for sections; limiting effects such as stall; calculation of pitching moment coefficient; methods for estimation of boundary flow and friction drag calculations; viscous-inviscid panel method numerical solutions; modelling of three dimension wing flows; lifting line theory and vortex lattice method.; effects of downwash, aspect ratio, sweep angle and asymmetry.

AERO5211
Foundations of Propulsion Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1hr lectures and one 2hr tutorial per week **Assumed knowledge:** Mathematics and Physics to a level of Bachelor of Science or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of the modern techniques used for aircraft propulsion. Students will gain skills in problem solving for aircraft propulsion systems ranging from propellers, gas-turbine engines to rockets. This unit of study teaches the students the techniques used to propel aircraft and rockets. The students will learn to analyse various propulsion systems in use: propellers, gas turbines, rocket motors. Course content will include: Propulsion unit requirements subsonic and supersonic flight; thrust components, efficiencies, additive drag of intakes; Piston engine components and operation; Propeller theory; Operation, components and cycle analysis of gas turbine engines, turbojets, turbofans, turboprops, ramjets; Components: compressor; fan; burner; turbine; nozzle, efficiency of components; off-design considerations; Operation, components and thermodynamics of rocket motors; Dynamics of rocket flight, orbital velocity; staging; Future directions; minimisation of noise and pollution; sub-orbital propulsion systems; scram-jets; hybrid engines.

AERO5301
Applied Finite Element Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of workgroup session per week **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering field. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The finite element method. Philosophy. Matrix algebra. Matrix analysis of structures. Generalisation of the finite element method in elasticity for static, dynamic and thermal analysis. Rod elements. Beams. Triangular elements for plane stress. Natural coordinate systems. Introduction to plate and shell theory. Theories and analysis in structural stability. Three dimensional elements. Modelling strategies. Isoparametric elements, accuracy and convergence. Applications of finite element modelling in solid mechanics. Practical modelling of real structures will be done; a 'hands-on' approach will be taken.

AERO5310
Foundations of Aerospace Structures

Credit points: 6 **Session:** Semester 1 **Classes:** 3hrs of lectures per week and 2hrs tutorial per week **Assumed knowledge:** Mathematics and Physics to a level of Bachelor of Science or equivalent. Linear Mathematics, Vector Calculus,

Differential Equations and Fourier Series. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop a student's understanding of the theoretical basis of advanced aerospace structural analysis; and introduce students to the solution of real-world aircraft structural problems. This UoS will develop the following attributes: An understanding of the derivation of the fundamental equations of elasticity and their application in certain analytical problems; An understanding of plate theory and the ability to use this to obtain analytical solutions for plate bending and buckling problems; An understanding of energy-method solution techniques for structural problems; An understanding of the basic principals behind stressed-skin aircraft construction and the practical analysis of typical aircraft components, including the limitations of such techniques.

At the end of this unit students will have an understanding of: 2-D and 3-D elasticity: general equations and solution techniques; Energy methods in structural analysis, including the principles of virtual work and total potential and complimentary energies; Fundamental theory of plates, including in-plane and bending loads as well as buckling and shear instabilities; Solution techniques for plate problems including: Navier solutions for rectangular plates; Combined bending and in-plane loading problems; Energy methods for plate-bending; and Plate buckling for compression and shear loadings; Bending of beams with unsymmetrical cross-sections; Basic principals and theory of stressed-skin structural analysis; Determination of direct stresses and shear flows in arbitrary thin-walled beams under arbitrary loading conditions including: Unsymmetrical sections, Open and closed sections, Single and multi-cell closed sections, Tapered sections, Continuous and idealized sections; The analysis of common aircraft components including fuselages, wings, skin-panels, stringers, ribs, frames and cut-outs; The effects of end constraints and shear-lag on the solutions developed as well as an overall appreciation of the limitations of the solution methods presented.

AERO5400
Advanced Aircraft Design Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lectures per week. **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering field. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This Unit aims to provide familiarity and understanding with practical aircraft design processes expected in industry, including the evaluation and case studies of existing aircraft designs. Students will gain a better understanding of relevant issues particularly related to the design of aircraft with a level of confidence to lead them to develop new designs or modifications, having a good balance between theory and real-world applications. Good familiarity with unique and stringent international aviation regulations and certification processes will be expected with respect to the design of aircraft. Topics coved by the lectures will include aircraft specifications; aircraft selection and evaluation; aircraft configuration design; design considerations for aerodynamics, structures, systems, manufacture, testing, certification, life-cycle-cost, operations; the use of computational aircraft design tools, in particular DARcorp's Advanced Aircraft Analysis (AAA); and introduction to multidisdiplinary design optimisation methods. Projects will be based on case study analyses and evaluation of aircraft types to operational specifications and requirements.

AERO5410
Foundations of Aerospace Design

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1hr lectures and one 3hr project class per week. **Assumed knowledge:** Mathematics, Physics and Solid Mechanics assumed knowledge at the level of Bachelor of Science or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to introduce students to the theory and practice of aircraft structural component design. In doing so it will emphasize all the considerations, trade-offs and decisions inherent in this process and thus enable students to gain an understanding of why aircraft structures are designed in the way they are with respect to structural, manufacturing and cost considerations.

At the end of this unit students will be able to understand the design process, especially as it applies to aircraft structural component design; Have a familiarity with some of the practice of aircraft component structural design; An increasing familiarity with typical aircraft structural paradigms and how they work and can be analysed along with the primary failure modes that need to be considered; An understanding of the importance of different failure modes for different components and how these relate to load-conditions and understanding of some off the legal and ethical requirements of aircraft design engineers; A basic understanding of the regulatory framework in which aircraft design is conducted.

AERO5500
Flight Mechanics Test and Evaluation Adv

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. 2hrs of laboratory per semester. **Prerequisites:** AERO5510 **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering Field. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of aircraft flight test, validation and verification, and the development of modern flight control, guidance, and navigation systems. Students will gain skills in analysis, problem solving and systems design in the areas of aircraft dynamic system identification and control. At the end of this unit students will be able to understand elements of the following: the principles of stability augmentation systems and autopilot control systems in aircraft operation, their functions and purposes; the characteristics of closed loop system responses; advanced feedback control systems and state-space design techniques; the concepts of parameter and state estimation; the design of observers in the state space and the implementation of a Kalman Filter; multi-loop control and guidance systems and the reasons for their structures; flight test principles and procedures and the implementation a flight test programme.

AERO5510
Foundations of Flight Mechanics

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. **Assumed knowledge:** Mathematics, Physics and Dynamics assumed knowledge at the level of Bachelor of Science or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of aircraft longitudinal equilibrium, static stability, dynamic stability and response. Students will develop an understanding of the importance and significance of flight stability, will gain skills in dynamic system analysis and will learn mathematical tools used for prediction of aircraft flight behaviour. Students will gain skills in problem solving in the area of flight vehicle motion, and learn the fundamentals of flight simulation.

At the end of this unit students will be able to understand: aircraft flight conditions and equilibrium; the effects of aerodynamic and propulsive controls on equilibrium conditions; the significance of flight stability and its impact of aircraft operations and pilot workload; the meaning of aerodynamic stability derivatives and their sources; the effects of aerodynamic derivatives on flight stability; the impact of flight stability and trim on all atmospheric flight vehicles, including launch and re-entry of space vehicles. Students will also be able to model aircraft flight characteristics using computational techniques and analyse the aircraft equations of rigid-body motion and to extract stability characteristics.

Course content will include static longitudinal aircraft stability: origin of symmetric forces and moments; static and manoeuvring longitudinal stability, equilibrium and control of rigid aircraft; aerodynamic load effects of wings, stabilisers, fuselages and power plants; trailing edge aerodynamic controls; trimmed equilibrium condition; static margin; effect on static stability of free and reversible controls.

AERO5660
Safety Systems Management

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objective : To develop an understanding of the current state of aerospace manufacturing, operations and maintenance for the Australian aviation industry. Students will gain skills in aerospace engineering risk management.

Syllabus: Principles and practice of aviation and airline risk management. Discussion and analysis of airline operations. Flight safety and airworthiness standards. Risk and reliability management. Project Management focusing on risk analysis and mitigation.

AERO5760
Spacecraft and Satellite Design

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours of project work in class per week. **Assumed knowledge:** BE in Aerospace Engineering or Equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This course aims to introduce the students to the engineering aspects of spacecraft and mission design, covering the space environment and spacecraft sub-systems, including thermal control, power systems, attitude decision and control system, tracking, telemetry & telecommand, and on-board data handling.

AERO5901
Project 1 and Seminar in Aerospace Eng

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time, **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering fields. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Projects 1 & 2 and seminar in Aerospace Engineering aim to develop an understanding of carrying out aerospace engineering projects, enhance students' ability in handling complex engineering cases and in technical organisation and communication, and to provide students an opportunity to understand project research. Engineering skills to be developed include the capacity to define a research question, showing how it relates to existing knowledge, identifying the tools needed to investigate the question, carrying out the research in a systematic way, analysing the results obtained and presenting the outcomes in a report that is clear, coherent and logically structured. The project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Project 1 and seminar in Aerospace Engineering covers first steps of thesis research starting with development of research proposal. Project 2 and seminar in Aerospace Engineering covers the second of stage writing up and presenting the research results. Students are required to write a thesis based on a research project in aerospace engineering. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of equipment. Direction of thesis work may be determined by the supervisor or be of an original nature, but in either case the student is responsible for the execution of the practical work and the general layout and content of the thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors. It is not expected that a thesis at this level will represent a significant contribution to new knowledge; nor is it expected that theses will resolve great intellectual problems. The timeframe available for the thesis is simply too short to permit students to tackle complex or difficult problems. Indeed, a key aim of the project is to specify a research topic that arouses sufficient intellectual curiosity, and presents an appropriate range and diversity of technical and conceptual challenges, while remaining manageable and allowing achievable outcomes within the time and resources available. It is important that the topic be of sufficient scope and complexity to allow a student to learn their craft and demonstrate their research skills. Equally imperative is that the task not be so demanding as to elude completion.

AERO5902
Project 2 and Seminar in Aerospace Eng

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time, **Corequisites:** AERO5901 **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering field. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

A student enrolled in AERO5901 Project 1 & Seminar in Aerospace Engineering in his/her first semester should continue with the smae project in the second semester. Projects 1 & 2 and seminar in Aerospace Engineering aim to develop an understanding of carrying out aerospace engineering projects, enhance students' ability in handling complex engineering cases and in technical organisation and communication, and to provide students an opportunity to understand project research. Engineering skills to be developed include the capacity to define a research question, showing how it relates to existing knowledge, identifying the tools needed to investigate the question, carrying out the research in a systematic way, analysing the results obtained and presenting the outcomes in a report that is clear, coherent and logically structured. The project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Project 1 and seminar in Aerospace Engineering covers first steps of thesis research starting with development of research proposal. Project 2 and seminar in Aerospace Engineering covers the second of stage writing up and presenting the research results. Students are required to write a thesis based on a research project in aerospace engineering. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of equipment. Direction of project work may be determined by the supervisor or be of an original nature, but in either case the student is responsible for the execution of the practical work and the general layout and content of the thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors. It is not expected that a thesis at this level will represent a significant contribution to new knowledge; nor is it expected that theses will resolve great intellectual problems. The timeframe available for the thesis is simply too short to permit students to tackle complex or difficult problems. Indeed, a key aim of the project is to specify a research topic that arouses sufficient intellectual curiosity, and presents an appropriate range and diversity of technical and conceptual challenges, while remaining manageable and allowing achievable outcomes within the time and resources available. It is important that the topic be of sufficient scope and complexity to allow a student to learn their craft and demonstrate their research skills. Equally imperative is that the task not be so demanding as to elude completion.

AMME5101
Power Plant Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hrs lectures and 2hrs tutorials per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit is suitable for any engineering discipline student who is interested in developing an understanding of analysis and design in

energy, power generation, environment and relevant economic issues. The aim is to acquaint students with the methods engineers use to design and evaluate the thermal processes used for the production of electricity. It also assesses and deals with the environmental consequences of power generation. At the end of this unit students will be able to carry out preliminary design and economic impact analyses for electrical power generation systems. A series of topics will be covered in relation to energy and electricity and relevant issues.

The course contents will include:

1. Economic analysis of energy systems;
2. Environmental impact of power generation;
3. Principles of thermodynamics;
4. First law analysis of power cycles;
5. Design and simulation of power generation cycles;
6. Second law efficiency and availability;
7. Energy efficiency;
8. CO2 capture and sequestration;
9. Design of various components of thermal power plants.

AMME5200
Foundations of Thermodynamics and Fluids

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures : 3hr per week; Tutorials : 2 hours per week **Assumed knowledge:** Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to teach the basic laws of thermodynamics and the fundamentals of fluid statics and dynamics. At the end of this unit students will have: an understanding of the basic laws of thermodynamics and basic equations governing the statics and dynamics of fluids; the ability to analyze the thermodynamics of a simple open or closed engineering system; the ability to analyze and determine the forces governing static fluid; the ability to evaluate the relevant flow parameters for fluid flow in internal engineering systems such as pipes and pumps (velocities, losses, etc.) and external systems such as flow over wings and airfoils (lift and drag). Course content will include concepts of heat and work, properties of substances, first law of thermodynamics, control mass and control volume analysis, thermal efficiency, entropy, second law of thermodynamics, reversible and irreversible processes, isentropic efficiency, power and refrigeration cycles; basic concepts of pressure, force, acceleration, continuity, streamline and stream function, viscosity, non-dimensional parameters; Fluid statics: governing hydrostatic equations, buoyancy; Fluid dynamics: governing conservation equations; Potential flow, vorticity and circulation; Bernouilli and Euler equations; A brief introduction to flow measuring devices, pipe flow, flow over surfaces, lift and drag.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures : 1 hour per week; Tutorials : 1 hour per week; Laboratory Sessions : 2 hours per week **Assumed knowledge:** Partial differential equations; Finite difference methods;Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives: To provide students with the necessary skills to use commercial Computational Fluid Dynamics packages and to carry out research in the area of Computational Fluid Dynamics. Expected outcomes: Students will have a good understanding of the basic theory of Computational Fluid Dynamics, including discretisation, accuracy and stability. They will be capable of writing a simple solver and using a sophisticated commercial CFD package. Syllabus summary: A course of lectures, tutorials and laboratories designed to provide the student with the necessary tools for using a sophisticated commercial CFD package. A set of laboratory tasks will take the student through a series of increasingly complex flow simulations, requiring an understanding of the basic theory of computational fluid dynamics (CFD). The laboratory tasks will be complemented by a series of lectures in which the basic theory is covered, including: governing equations; finite difference methods accuracy and stability for the advection equation, diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5218
Research Dissertation

Credit points: 24 **Session:** Semester 1, Semester 2 **Classes:** Project work carried out in own time **Prerequisites:** The completion of 48 CP from the MPE degree program **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The aim of this unit of study is to obtain an understanding of how to define, plan, undertake and report on an open-ended piece of supervised research or design work. Students will discuss the thesis topic with the supervisor and generate a suitable thesis plan with proposed outcomes. They will then conduct a literature survey and background research. Students are asked to write a detailed report on a major research or design project. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of equipment. In the normal course of events some or all of the theoretical, developmental and experimental aspects of design or research work will be covered in this unit of study. These aspects may be either directed by the supervisor or be of an original nature, but in any event the student is responsible for the execution of his or her practical work and the general layout and content of the Thesis document. During the course of this unit of study, students will learn how to examine published and experimental data, set objectives, organize a program of work and analyse results. They will also be expected to evaluate these results in relation to existing knowledge. The Thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors in seminar.

AMME5271
Computational Nanotechnology

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures : 2 hours per week; Tutorials : 3 hours per week **Assumed knowledge:** Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This course introduces atomistic computational techniques used in modern engineering to understand phenomena and predict material properties, behaviour, structure and interactions at nano-scale. The advancement of nanotechnology and manipulation of matter at the molecular level have provided ways for developing new materials with desired properties. The miniaturization at the nanometre scale requires an understanding of material behaviour which could be much different from that of the bulk. Computational nanotechnology plays a growingly important role in understanding mechanical properties at such a small scale. The aim is to demonstrate how atomistic level simulations can be used to predict the properties of matter under various conditions of load, deformation and flow. The course covers areas mainly related to fluid as well as solid properties, whereas, the methodologies learned can be applied to diverse areas in nanotechnology such as, liquid-solid interfaces, surface engineering, nanorheology, nanotribology and biological systems. This is a course with a modern perspective for engineers who wish to keep abreast with advanced computational tools for material characterization at the atomic scale.

AMME5301
Foundations of Mechanics of Solids 1

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures : 3 hours per week; Tutorials : 2 hours per week **Assumed knowledge:** Physics, statics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to teach the fundamentals of analysing stress and deformation in elemental structures/components in aerospace, mechanical and biomedical engineering (bars, beams, frames, cell box beams and tubes) under simple and combined loading of tension, compression, bending and torsion. The vibration will also be addressed. At the end of this unit students will have gained knowledge of: equilibrium of deformable structures; basic concept of deformation compatibility; stress and strain in bars, beams and their structures subjected to tension, compression, bending, torsion and combined loading; statically determinate and indeterminate structures; energy methods for bar and beam structures; simple buckling; simple vibration; deformation of simple frames and cell box beams; simple two-dimensional stress and Mohr's circle; problem-based applications in aerospace, mechanical and biomedical engineering.

AMME5302
Foundations of Materials 1

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures : 3 hours per week; Tutorials : 2 hour per week. **Assumed knowledge:** Fundamental physics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to cover four key focus areas: Atomic structure of the solid state: atomic bonding, crystal structures, crystal imperfections, and diffusion; Mechanical properties and microstructure: the relationship between properties and microstructure, and the effects of heat treatment on properties and microstructure; Electrical, magnetic, thermal, and optical properties of materials; Manufacture and applications of materials: metals, ceramics, polymers. At the end of this unit students will have gained an understanding of: the ways in which atoms are arranged in the solid state; the ways in which their arrangement and the imperfections of their arrangement affect the macroscopic properties of a material; gain an understanding of the various types of properties of materials, how to measure and calculate them, and how to use these skills in engineering design and failure analysis; gain an understanding of the means by which the properties of materials can be manipulated via heat treatment, alloying, and other means. Course content will include: Atomic Structure/Crystallography; Microstructure - Composites/Monolithics; Dislocation Theory; Diffusion; Phase Equilibrium and Heat Treatment; Suspension Rheology; Physical Properties.

AMME5500
Foundations of Engineering Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures : 3 hours per week; Tutorials : 2 hours per week; Lab Sessions 6 hours per semester. **Assumed knowledge:** Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to teach: Dynamics of Rigid Bodies: Analysis of Planar mechanisms; Kinematics of rigid bodies; Kinetics of rigid bodies. Students will also develop their skills in: how to model and analyse dynamic systems and the application of theory to real systems through practical/laboratory sessions. At the end of this unit students will have developed skills in modelling and analysing planar mechanisms and rigid body dynamic systems. Course content will include planar mechanisms, linkages, mobility; instant centres of rotation, Kennedy's theorem; velocity and acceleration polygons; kinematics of rigid bodies, frames of reference, velocity and acceleration, rotating frame of reference, relative velocity and acceleration, gyroscopic acceleration; kinetics of rigid bodies, linear momentum and Euler's first law; angular momentum and Euler's second law; centre of mass; moments of inertia, parallel axis and parallel plane theorems, principal axes and principal moments of inertia, rotation about an axis; impulse and momentum; work and energy, kinetic and potential energies; applications to orbital and gyroscopic motion; introduction to Lagrangian methods.

AMME5501
Foundations: System Dynamics and Control

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures : 2 hours per week; Tutorials : 3 hours per week **Assumed knowledge:** AMME5500 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to allow students to develop an understanding of methods for modeling and controlling linear, time-invariant systems. Techniques examined will include the use of differential equations and frequency domain approaches to modeling of systems. This will allow students to examine the response of a system to changing inputs and to examine the influence of external stimuli such as disturbances on system behaviour. Students will also gain an understanding of how the responses of these mechanical systems can be altered to meet desired specifications and why this is important in many engineering problem domains. The study of control systems engineering is of fundamental importance to most engineering disciplines, including Electrical, Mechanical, Mechatronic and Aerospace Engineering. Control systems are found in a broad range of applications within these disciplines, from aircraft and spacecraft to robots, automobiles, computers and process control systems. The concepts taught in this course introduce students to the mathematical foundations behind the modelling and control of linear, time-invariant dynamic systems.

In particular, topics addressed in this course will include:

1. Techniques for modelling mechanical systems and understanding their response to control inputs and disturbances. This will include the use of differential equations and frequency domain methods as well as tools such as Root Locus and Bode plots.

2. Representation of systems in a feedback control system as well as techniques for determining what desired system performance specifications are achievable, practical and important when the system is under control

3. Theoretical and practical techniques that help engineers in designing control systems, and an examination of which technique is best in solving a given problem.

AMME5601
Professional Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs per week and tutorials 2 hrs per week **Assumed knowledge:** Manufacturing, management experience or equivalent. Equivalent to AMME4100 Practical Experience, ENGG1803 Professional Engineering 1, MECH3661 Engineering Management **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to create an awareness of the issues surrounding management of projects and in general management in engineering plants; impart knowledge resulting in a more global approach to the practice of engineering and engineering management; provide a vehicle for improving communication skills. The course also aims, when taken together with other courses offered by the School, to substantially meet the requirement of the Institution of Engineers, Australia, for undergraduate training in management theory. On completion of this unit students should be able to: plan small projects, and contribute effectively to planning of larger projects; understand what is required of you in your role in the conduct and management of an engineering project; perform well in that role from the outset, with your performance limited only by your experience; prepare an interesting presentation on aspects of your work for your peers or senior managers; recognise the range of expertise you may need to call on in your role as an engineer working on a project (e.g. in the safety and environmental fields); Have an awareness of ethical and other issues which can arise in the workplace; be aware of the impact of Global Warming, Climate Change and related issues threatening sustainability and have some appreciation of the role for engineers in proposing solutions; be familiar with ergonomic design principals; understand what the experts are saying, and to be able to contribute effectively to that discussion, so making effective use of that expertise.

AMME5602
Product Life Cycle Design

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work in Class : 5 hours per week **Assumed knowledge:** Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

A core unit of study for the degree of Master of Engineering Studies covering the following aspects: Interfaces of product's functional requirements and product's design attributes; Mapping of product's design attributes into the manufacturing requirements; The business constraints of bringing new products into the market place; Product life cycle management.

AMME5901
Anatomy and Physiology for Engineers

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures : 2.5 hours per week; Laboratory : 12 hours per semester. **Assumed knowledge:** Biology **Campus:** Cumberland **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims for students to gain familiarity with anatomical and physiological terms and understanding their meaning. Students should gain an understanding of the gross anatomy of the major systems in the human body and their importance in the design of biomedical devices. Students should gain an understanding of the major physiological principles which govern the operation of the human body. At the end of this unit students will be able to: identify the gross anatomical features of the human body; describe the normal function of the major body systems (nervous, circulatory, respiratory, musculoskeletal, digestive and renal); determine how these functions relate to cellular function; determine how a biomedical engineering device affects the normal anatomy and function of the body. Course content will include: Bone tissue; Skeletal system; Joints; Muscle Tissue; Bones & joints anatomy (prac); Muscle Mechanics; Muscle anatomy (prac); Nerve Tissue; Muscles & nerves prac; CVS Heart; Blood vessels; Respiratory System 1; Respiratory System 2; Homeostasis; CVS and Respiratory anatomy (prac); Physiology; Respiratory Physiology; Cardio-respiratory physiology (prac); Renal Anatomy; Renal Physiology; Abdominal Renal Digestive Anatomy; Digestive Physiology; Oral Presentation.

AMME5902
Computer Aided Manufacturing

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 2 hours per week; Tutorials: 2 hours per week; Laboratory: 3 hours per semester. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The aim of this course is to enhance the student's manufacturing engineering skills in the CAD/CAM area. The course focuses on CNC milling as a manufacturing automation process applied to a project. The management, planning and marketing of a typical engineering project are also discussed.

Objectives:Through integrated project-based learning and hands-on-machine training, you will learn

How to successfully complete a CAD/CAM and CNC mill based project.

Manufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;

The science in designing and selecting a manufacturing method.

How to effectively present your ideas and outcomes using oral and report based methods.

AMME5912
Crash Analysis using LS-DYNA

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hours per week, Tutorials 2 hours per week, Project Work - own time, **Assumed knowledge:** Computer Aided Drafting, Basic FEA principles and Solid Mechanics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objective of the course is to give students skills in the area of highly non-linear finite element analysis. Major topics covered include CAD, Implicit / explicit codes, Wire frame geometry, Elemental Theory, Materials, Pre-processing using ETA-VPG, Contact, LS-Dyna, using NCAC FEM models, Modeling fasteners, Material covered in lectures is reinforced through independent research, assignments, quizzes and a major capstone project. The capstone project involves the development of an approved crash scenario.

AMME5921
Biomedical Engineering Tech 2

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures : 4 hours per week **Assumed knowledge:** A bachelors degree, ideally in the engineering or science field, is advisory, but not essential. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study provides an introduction to the field of biomedical engineering, from the point of view of the engineering and the global biomedical industry itself. After completion of this unit, students will have a clear understanding of what biomedical engineering is, both from the engineering perspective and the commercial/industry perspective.

AMME5961
Biomaterials Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures : 3 hours per week **Assumed knowledge:** Chemistry, biology, materials engineering, and engineering design at least at the Junior level. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To gain a basic understanding of the major areas of interest in the biomaterials field, learn to apply basic engineering principles to biomedical systems, and understand the challenges and difficulties of biomedical systems. To participate in a project-based-learning approach to the topic of design with Biomaterials.

AMME5971
Applied Tissue Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 2 hours per week; Tutorials: 2 hours per week **Assumed knowledge:** Biology, chemistry at a junior level and intermediate physiology or equivalent **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Elective Unit of Study: With the severe worldwide shortage of donor organs and the ubiquitous problem of donor organ rejection, there is a strong need for developing technologies for engineering replacement organs and other body parts. Recent developments in biochemistry and cell biology have begun to make this possible, and as a consequence, the very new field of tissue engineering has been making dramatic progress in the last few years.

This UoS will provide an introduction to the principles of tissue engineering, as well as an up to date overview of recent progress in the field of tissue engineering is and where it is going. This UoS assumes prior knowledge of cell biology and chemistry and builds on that foundation to elaborate on the important aspects of tissue engineering. The objectives are:

Objectives:

1. To gain a basic understanding of the major areas of interest in tissue engineering

2. To learn to apply basic engineering principles to tissue engineering systems

3. To understand the challenges and difficulties of tissue engineering.

4. Understand the ethical issues of stem cell applications.

5. Practical classes in the preparation and evaluation of scaffolds for tissue regeneration.

6. Enable student to access web-based resources in tissue engineering (for example: Harvard-MIT Principles and Practice of Tissue Engineering).

7. Research basic skills in Tissue Engineering

Learning outcomes:

1. To develop a theoretical understanding of the basic concepts of tissue engineering and be exposed to the various specific disciplines of this field. The students will develop specific expertise through the lectures given by invited speakers at the forefront of their research.

2. To achieve effective communications the class will be divided into small groups where each group will present their findings on their assigned project/paper for discussion with the whole class on their results, ideas and critically evaluate their scientific findings

3. The students will each complete an individual assignment on the applications of tissue engineering to ophthalmology, dental, skeletal tissue, skin, neural, vascular and cardiology. In their assignment they will discuss the advances and future direction and identify key areas of shortcoming in the specific fields and discuss the general problem and possible solutions

4. Students will gain expertise by conducting a scientific literature review of the current progress in the field of tissue engineering in general. Specifically, they will undertake a thorough scientific search on the latest development in the research conducted in their chosen assignment topic.

5. Team work skills will be developed by participating in group tutorial projects. Each group will then discuss the assigned paper/project in detail, decide on key points and then report back to the entire class

AMME5981
Computational Biomedical Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures: 2 hours per week; Tutorials: 2 hours per week **Assumed knowledge:** Fundamental Materials, Mechanics of Solids, Engineering Dynamics, Biomedical Design and Technology. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS will give students a comprehensive understanding of finite element method, material constitutive modelling, CT/MRI based solid modelling, design analysis and optimisation, and their applications in biomedical engineering. The students are expected to expand their research and development skills in relevant topics, and gain experience and skills in finite element software for the solution to sophisticated problems associated with biomedical engineering.

The objectives are:

1. Understanding of the nature of biomedical engineering problems;

2. Exploring CT/MRI image processing, solid modelling etc;

3. Understanding of finite element methods and developing FE models for biomedical engineering analysis;

4. Understanding biomaterials constitutive modelling;

5. Understanding bone remodelling simulation, fracture mechanics;

6. Developing prosthetic design optimisation;

AMME5990
Biomedical Engineering Tech 1

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures: 2 hours per week; Tutorials: 2 hours per week **Assumed knowledge:** Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Elective Unit of Study: Product development in the biomedical area presents unique challenges that need to be addressed to efficiently satisfy strict regulatory requirements and to successfully advance products to approval for marketing. Biomedical engineers need a broad understanding of these challenges as the main components of product development are complex and interdependent. Development of good manufacturing and quality control processes, preclinical and clinical validation of product safety and efficacy, and regulatory filings, are each progressive and interdependent processes. This UoS will provide a broad understanding of regulatory requirements for biomedical product development, with particular emphasis on the dependence of each component on the development of processes and control systems that conform to Good Manufacturing Practice. This UoS assumes prior knowledge of cell biology and chemistry and builds on that foundation to elaborate on the important aspects of biomedical product development.

The objectives are:

1. To gain a broad understanding of biomedical product development within the regulatory framework.

2. To understand the challenges and difficulties of Good Manufacturing Practice.

3. Understand the purpose and conduct of preclinical and clinical testing.

4. To understand how each of these components fit together to support regulatory filings.

MECH5255
Air Conditioning and Refrigeration (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 1 hour of tutorials per week. **Prohibitions:** MECH4255 **Assumed knowledge:** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study develops an advanced knowledge of air conditioning systems and refrigeration applications. At the completion of this unit students will be able to determine thermal loads on structures and design an air conditioning or refrigeration system with attention to comfort, control, air distribution and energy consumption. Course content will include: applied psychrometrics, air conditioning systems, design principles, comfort in the built environment. cooling load calculations, heating load calculations, introduction and use of computer-based load estimation packages software, air distribution, fans, ducts, air conditioning controls, advanced refrigeration cycles, evaporators, condensers, cooling towers, compressors, pumps, throttling devices, piping, refrigerants, control, refrigeration equipment, simulation of refrigeration systems, food refrigeration and industrial applications; Use of CFD packages as tools to simulate flows in building and to optimise air conditioning design, energy estimation methods and software, energy evaluation and management in the built environment. Use of experimental air conditioning systems to test for thermal balances and compare with simulations.

Textbooks
References:
American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Handbook of fundamentals, 1997, 2001, 2005.
McQuiston, F. C. and Parker, J. D., "Heating Ventilation and Air Conditioning, Analysis and Design", 4th ED. Wiley 1994.
Stocker, W. F. and Jones, J. W., "Refrigeration and Air Conditioning" 2nd Ed., McGraw Hill, 1985.

MECH5261
Foundations of Fluid Mechanics

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** MECH3261 **Assumed knowledge:** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series; AMME5200 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to provide students with a detailed understanding of the theory and practice of fluid mechanics in the context of mechanical engineering. At the end of this unit students will have the ability to critically assess and solve problems commonly found in fluid mechanics practice, such as sizing pumps and piping systems, designing channels, and determining the lift and drag characteristics of submerged bodies. Additionally, they will develop a structured and systematic approach to problem solving. Course content will include: Navier-Stokes equations: derivation, significance and fundamental importance. Pipe flow: Bernoulli, shear losses, minor losses, networks. Pumps: pump types, characteristics, applications. Flow around submersed bodies: lift and drag Boundary layers: derivation of equations, laminar and turbulent, transition, momentum integral method, law of the wall, velocity profiles. Turbulence: concept, properties of turbulent flow, eddy viscosity models, more advanced approaches. Channel flow: flow in a channel, weir, hydraulic jump Gas dynamics: steady one-dimensional flow including friction and heat transfer, sound waves, normal shock, nozzle flow, shock tube.

MECH5262
Foundations of Thermal Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Prerequisites:** AMME5200 **Prohibitions:** MECH3260 **Assumed knowledge:** Fundamentals of thermodynamics are

needed to begin this more advanced course. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop an understanding of: the principles of thermodynamic cycles, gas mixtures, combustion and thermochemistry applied to engineering processes, power and refrigeration systems; heat transfer equipment design. To classify heat transfer situations as conduction, convection, radiation, forced or natural convection. To determine the appropriate approach to problems, the type of solution needed, analytical or numerical. To be able to arrive at a solution and predict heat transfer rates and be able to design and size heat transfer equipment.

At the end of this unit students will be able to: apply the principles of thermodynamics and heat transfer to real engineering situations; have the Ability to tackle and solve a range of complex thermodynamics cycles, air conditioning, combustion, chemical equilibrium, problems involving gas mixtures; have the ability to tackle and solve a range of heat transfer problems including finned heat exchangers, cooling by fluids, quenching, insulation and solar radiation.

Course content will include: Thermodynamics: Exergy and entropy, Power: spark ignition, Power: diesel, Power: gas turbine, Power: stirling, Power: steam, Gas mixtures, Clausius-Clapeyron, Humidity, psychrometry, Air-conditioning, Combustion: stoichiometry, gas analysis, Combustion, thermochemistry, adiabatic flame,temperature Combustion, 2nd Law of Thermo., equilibrium, exergy, Heat Transfer: Conduction, thermal circuits, General conduction equation, cylindrical fins, Heat Exchangers, Numerical solutions, Unsteady conduction, Convection, analytical, Forced convection correlations, Natural convection, boiling, Radiation spectrum, blackbody, Radiation properties and laws, Radiation environmental, solar.

MECH5265
Advanced Combustion

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 3 hours of tutorials per week. **Prerequisites:** MECH5262 **Prohibitions:** MECH4265 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to give students a sound understanding of combustion and some of its applications such as internal combustion engines, gas turbines and fires. At the completion of this unit students will be able to perform an analysis of simple reacting systems, calculate the structure of simple premixed and diffusion flames, and analyse thermal and flow processes in fires and combustion chambers of practical devices. Course content will include: equilibrium compositions, flammability limits, simple chemically reacting systems, detailed chemical kinetics, the basic theory underlying laminar and turbulent combustion for both premixed and non-premixed cases, an introduction to droplet combustion, the concept of mixture fraction for non-premixed flames, combustion in engines and gas turbines as well as the formation of pollutants. Some computational tools in combustion will be introduced. Fire ignition, growth and spread will also be covered with respect to safety in buildings including the hazards related to the formation of smoke and toxic products.

MECH5275
Advanced Renewable Energy

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours of tutorials per week. **Assumed knowledge:** The students will require an understanding of the basic principles of fluid mechanics, thermodynamics and heat transfer, and the application of these principles to energy conversion systems. In particular, students should be able to analyse fluid flow in turbomachinery; perform first and second law thermodynamic analysis of energy conversion systems; and perform calculations of radiative, conductive and convective heat transfer. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to develop understanding of the engineering design and analysis of different devices and technologies for generating power from renewable sources including: solar, wind, wave, tidal, ocean thermal, geothermal, hydro-electric, and biofuels; to understand the environmental, operational and economic issues associated with each of these technologies. At the end of this unit students will be able to perform in depth technical analysis of different types of renewable energy generation devices using the principles of fluid mechanics, thermodynamics and heat transfer. Students will be able to describe the environmental, economic and operational issues associated with these devices.

MECH5304
Materials Failure

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hour per week, Tutorial 1 hour per week, Laboratory 3 hours per week. **Assumed knowledge:** Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: An elective unit of study for the degree of Master of Engineering

Develop advanced knowledge and skills in diagnostic analyses of materials failure using advanced techniques; enhance students' ability in handling complex engineering cases using interdisciplinary technologies; and provide students an opportunity to understand project research.

MECH5305
Smart Materials

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures, 1 hour of tutorials and 3 hours of laboratory work per week. **Assumed knowledge:** Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Develop an essential understanding of structure-property relationship of smart materials, as well as their applications in practical applications; develop student's capability to design functional structures using smart materials; and provide students an opportunity to learn the new knowledge through project approaches.

MECH5310
Advanced Engineering Materials

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of tutorials per week. **Prohibitions:** MECH4310 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To understand (a) how to define the relationship between properties and microstructures of advanced engineering materials, (b) how to improve mechanical design with the knowledge of mechanics and properties of materials, and (c) how to conduct failure diagnosis of engineering materials.

MECH5361
Foundations of Mechanics of Solids 2

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Prerequisites:** AMME5301 **Prohibitions:** MECH3361 **Assumed knowledge:** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The UoS aims to: teach the fundamentals of analyzing 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 analyze 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 modeling; 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 introduce plates and shells and how to do analysis for plate and shell structures; 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 ultimate outcome is that the students have the ability to solve engineering problems by comprehensively using the skills attained above.

Textbooks

Textbook:
Zhang, L.,Solid Mechanics for Engineers, Macmillan/Palgrave, Edn:,2001,
Reference:
Timoshenko & Goodier,Theory of Elasticity, McGraw Hill, Edn:,1951,
Chakrabarty,Theory of Plasticity, McGraw-Hill, Edn:,1987,
Chandrupatla and Belegundu,Introduction to Finite Elements in Engineering, Prentice Hall, Edn:,1991,
Courtney,Mechanical Behaviour of Materials, McGraw Hill, Edn:,1990,
Crandall, et al.,An Introduction to the Mechanics of Solids, McGraw Hill, Edn:,1978,

MECH5362
Foundations of Materials 2

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** AMME5302 **Prohibitions:** MECH3362 **Assumed knowledge:** Mechanics of solids: statics, stress, strain **Campus:** Camperdown/Darlington **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.

MECH5400
Foundations of Mechanical Design 1

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures, 2 hours of tutorials and 1 hour of computer lab per week **Prohibitions:** MECH2400 **Assumed knowledge:** Engineering Mechanics (statics and dynamics), and Mechanics of Solids **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

For students to experience the design process and to develop good engineering skills.

Course Objectives: To develop an understanding of: 1. the need for and use of standard drawings in the communication and definition of parts and assemblies, 2. creativity, 3. the design process, 4. methods used to analyse designs.

MECH5410
Advanced Design and Analysis 1

This unit of study is not available in 2011

Credit points: 3 **Session:** Semester 1 **Classes:** 2 hrs of lectures, 2hrs of tutorial per week. **Assumed knowledge:** ENGG1802 - Eng Mechanics, balance of forces and moments AMME2301 - Mechanics of Solids, 2 and 3 dimensional stress and strain AMME2500 - Engineering Dynamics - dynamic forces and moments. MECH2400 - Mechanical Design 1, approach to design problems and report writing, and preparation of engineering drawing MECH3460 - Mechanical design 2, means of applying fatigue analysis to a wide range of machine components **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This UoS utilises assumed theoretical knowledge and skills to elucidate the stresses and strains that exit in the different categories of machine parts. It sets out to make the students familiar with the simplifications that are applied to arrive at the analytic expressions commonly used to analyse each individual categories parts. These simplifications usually begin by assuming that only particular types of loads are carried by teh parts in that category. The resulting analyses provide approximations to the actual stresses. It is possible to have different degrees of simplifications, requiring more or less work, giving better or poorer approximations. Should a part be used to carry loads that were not allowed for in the traditional method then some more appropriate method must be found or developed. An important aspect is to make the student

practiced in a range of modern concepts, techniques and tools, and to be made aware of their strengths and limitations.

This UoS teaches the student how to recognise where and how their theoretical skills can be applied to the practical situations that they may encounter in this field of design.

Options may be provided in the choice of design assignments. Biomedical engineering and vehicle design problems may be provided as options to more general machine design problems.

MECH5660
Foundations of Manufacturing Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** MECH3660 **Assumed knowledge:** AMME5200, AMME5301, AMME5302 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit aims to teach the fundamentals of manufacturing processes and systems in mechanical, mechatronic and biomedical engineering, including traditional and advanced manufacturing technologies. This unit aims to develop the following attributes: to understand the fundamental principles of manufacturing technologies for the above mentioned engineering areas; to gain the ability to select existing manufacturing processes and systems for direct engineering applications; to develop ability to create innovative new manufacturing technologies for advanced industrial applications; to develop ability to invent new manufacturing systems.

At the end of this unit students will have a good understanding of the following: merits and advantages of individual manufacturing processes and systems; principles of developing new technologies; comprehensive applications and strategic selection of manufacturing processes and systems.

Course content will include: Manufacturing Processes: Common processes and their science (machining, casting, powder metallurgy, metal working, welding, polymer processing and composite manufacture); merits and limitations; NC and CAM; Introduction to advanced processes (sensor and actuator, IC, intelligent robots and biomedical and nano-technological device).

Manufacturing Systems: Economics in manufacturing; flexible manufacturing; just-in-time manufacturing; group technology; materials selection and requirements planning; quality control; introduction to new technology; introduction to e-manufacturing; human factors; plant layout.

Textbooks

Reference:
Amirouche, Farid,Principles of Computer-Aided Design and Manufacturing, Pearson Prentice Hall, Edn:2nd,2004,0 13 064631 8
Black, S.C., Chiles, V., Lissaman A.J. and Martin, S.J.,Principles of Engineering Manufacture, Arnold, Edn:,1996,0 470 23558 6
Chang, Tien-Chien, Wysk, Richard A. and Wang, Hsu-Pin,Computer-Aided Manufacturing, Pearson Prentice Hall, Edn:3rd,2005,0 13 129334 6
De Garmo, Black and Kosher,Materials and Processes in Manufacturing, Prentice-Hall, Edn:,1997,
Kalpakjian,Manufacturing Processes for Engineering Materials, Addison-Wesley, Edn:3rd,1997,
Kalpakjian,Manufacturing Engineering and Technology, Addison-Wesley, Edn:,1995,
Oberg, E. , Jones F.D. and Horton, H.L.,Machinery's Handbook, Industrial Press Inc., Edn:,2000,0 8311 2625 6
Rembold, Blume and Dillmann,Computer-Integrated Manufacturing Technology and Systems, Marcel Dekker, New York, Edn:,1985,
Yusuf Altintas,Manufacturing Automation, Cambridge, Edn:,2000,0-521-65973-6

MECH5701
Computers in Real Time Control and Inst

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of tutorials per week **Prohibitions:** MECH4730, MECH4710 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Syllabus Summary: Review of sensing, analogue and digital electronics, and overview of the IBM PC architecture. Programming for interactive control using both assembly language and high level languages. Timers and asynchronous tasks; data communication. Data structures for real-time programming. Multitasking and real time operating systems. Use of multi-tasking, message passing and multi-threading in environments such as NT and/or Unix. Object-oriented programming in C++. Design of interactive graphical displays; man-machine communication. Objectives: Microcomputer and microprocessor system, operating in real time have become very common components in today's engineering applications. The objective of this unit of study is to teach the fundamentals of real time software and to build competence in the engineering use of such systems through lectures emphasising standard computer architectures, real-time operating systems and programming, and through intensive laboratory work with microcomputer systems interacting with experimental mechatronic processes. Expected outcomes: The student will have a basic knowledge of the hardware components available in a microcomputer system and a detailed knowledge of facilities and capabilities typically present in a professional real time operating system. The student will have the competence to design, implement and debug real-time multitasking systems with graphical user interfaces.

MECH5720
Sensors and Signals

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week **Prohibitions:** MECH4720 **Assumed knowledge:** Strong MATLAB skills **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Syllabus Summary : This course starts by providing a background to the signals and transforms required to understand modern sensors. It goes on to provide an overview of the workings of typical active sensors (Radar, Lidar and Sonar). It provides insight into basic sensing methods as well as aspects of interfacing and signal processing. It includes both background material and a number of case studies.

The course covers the following topics:

a) SIGNALS: Complex signals, The Fourier Transform, Modulation, Frequency shifting & Convolution

b) PASSIVE SENSORS: Infrared Radiometers, Imaging Infrared, Passive Microwave Imaging & Image Intensifiers

c) ACTIVE SENSORS THE BASICS: Operational Principles, Time of flight (TOF) Measurement & Imaging, Range Tracking, Doppler Measurement, Phase Measurement

d) SENSORS AND THE ENVIRONMENT: Atmospheric Effects, Target Characteristics, Clutter Characteristics, Multipath

e) ACTIVE SENSORS: ADVANCED TECHNIQUES: Probability of Detection, Angle Measurement and Tracking, Combined Range/Doppler and Angle Tracking, Frequency Modulation and the Fast Fourier Transform, High Range Resolution, Wide Aperture Methods, Synthetic Aperture Methods (SAR)

Objectives: The course aims to provide students with a good practical knowledge of a broad range of sensor technologies, operational principles and relevant signal processing techniques.

Expected Outcomes: A good understanding of active sensors, their outputs and applicable signal processing techniques. An appreciation of the basic sensors that are available to engineers and when they should be used.

MECH5900
Thesis

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** No formal classes **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Theses should be typewritten on A4 with text, diagrams, graphs, photographs, etc, properly displayed. One copy should be submitted, hard-bound for the university library. Students are responsible for supplying their own thesis production materials.

Syllabus: Each prospective student is required to consult with prospective supervisors to apply for a topic. In the normal course of events some or all of the theoretical, developmental, and experimental aspects of research or design work are expected in a thesis. These aspects may be either directed by the supervisor or be of an original nature, but in any event the student is directly responsible to his or her supervisor for the execution of his and her practical work and the general layout of the thesis itself.

Objectives: To involve students in a research or major design project and give them the opportunity to conduct systematic investigations.

Expected outcomes: Ability to plan and execute a complete piece of scientific work and to report their study in a thesis.

MTRX5700
Experimental Robotics

Credit points: 6 **Session:** Semester 1 **Classes:** 2hrs lectures and 3hrs of laborarory work per week **Prohibitions:** MTRX4700 **Assumed knowledge:** Undergraduate degree level assumed knowledge in Mechatronic Engineering. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to present a broad overview of the technologies associated with industrial and mobile robots. Major topics covered are sensing, mapping, navigation and control of mobile robots and kinematics and control of industrial robots. The subject consists of a series of lectures on robot fundamentals and case studies on practical robot systems. Material covered in lectures is illustrated through experimental laboratory assignments. The objective of the course is to provide students with the essential skills necessary to be able to develop robotic systems for practical applications. At the end of this unit students will: be familiar with sensor technologies relevant to robotic systems; understand conventions used in robot kinematics and dynamics; understand the dynamics of mobile robotic systems and how they are modeled; have implemented navigation, sensing and control algorithms on a practical robotic system; apply a systematic approach to the design process for robotic systems; understand the practical application of robotic systems in applications such as manufacturing, automobile systems and assembly systems; develop the capacity to think creatively and independently about new design problems; undertake independent research and analysis and to think creatively about engineering problems. Course content will include: history and philosophy of robotics; hardware components and subsystems; robot kinematics and dynamics; sensors, measurements and perception; robotic architectures, multiple robot systems; localization, navigation and obstacle avoidance, robot planning; robot learning; robot vision and vision processing.

School of Chemical and Biomolecular Engineering

CHNG5001
Process Systems Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 1 hour per week, Tutorials: 2 hours per week. **Assumed knowledge:** Mathematics, physics and modeling. Assumed knowledge at the bachelor of Science level. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This unit of study is for Masters students and can be selected as an elective by 4th year students.

Whatever its purpose, any process requires some level of process monitoring and control to allow it to operate satisfactorily. Once a process is under control, the option exists to further improve performance via the implementation of some level of optimisation. This UoS will develop skills in integrating process modelling, simulation, design, optimisation and control concepts. The aims of this UoS are (i) to demonstrate that modelling, process control and optimisation are integral concepts in the overall consideration of industrial plants, (ii) to demonstrate that a unified approach allows a diversity of application fields to be readily handled, and (iii) to allow each student to achieve and demonstrate acceptable competency over the UoS material through a range of individual and group-based activities.

CHNG5003
Green Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures, 4 hours of tutorial/project work group per week. **Assumed knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year or their equivalent have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Green engineering, eco-technology and sustainable technology are all interchangeable terms for the design of products and processes that maximise resource and energy efficiency, minimise (or preferably eliminate) waste and cause no harm to the environment. In modern society, engineers equipped with the skills to develop sustainable technologies are tremendously valuable. This unit of study will examine cutting edge examples of sustainable technologies across a broad range of applications relevant to chemical and biomolecular engineering. The delivery of teaching and learning material will be exclusively in project mode. Students will be expected to critically analyse modern engineering processes and improve them, from the ground up if necessary, so that they satisfy the criteria of eco-design. At the completion of this unit of study students should have developed an appreciation of the underlying principles of green engineering and be able to demonstrate they can apply these skills to new and novel situations. Students are expected to develop an integrated suite of problem-solving skills needed to successfully handle novel (and previously unseen) engineering situations, coupled with an ability to independently research new areas and be critical of what is found, and an ability to cope with experimental data, change and uncertainty through critical thinking.

CHNG5004
Particles and Surfaces

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. 10 hours of lab work per semester. **Assumed knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year or their equivalent have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Particles and Surfaces: Mineral Processing. Aims and Objectives: Solid-solid and solid-liquid interactions are an important aspect in mineral processing. The aim of any mineral processing operation is the efficient extraction of the valuable metals or minerals (concentrate) from the waste materials in the ore (gangue). The goal of this course is to understand the various key steps and the corresponding principles required to achieve metal extraction from the ores.

Syllabus summary: This course will elucidate the principles in size reduction or comminution of the ore in liberating the valuable minerals, examine the microscopic details of solid-liquid, solid-gas and solid-solid interactions in mineral processing and their roles in macroscopic phenomena such as adhesion, wetting, adsorption, and mineral reactions such as reduction roasting and leaching. The general understanding of these factors will allow manipulation and improvement of performance in mineral beneficiation, dewatering of mineral slurries and extractive metallurgy.

By the end of this course students should develop a proficiency in characterisation of physical, surface and chemical properties of solids and metal aqueous streams; devising strategies to achieve extraction process objectives, within the constraints imposed by social, economic and physical environments, developing management strategies for treating liquid and solid effluents and becoming familiar with computer software packages in modelling aqueous and solid systems.

CHNG5005
Wastewater Eng - Systems and Practice

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 1 hr of tutorials per week. 3hr Lab work per week. **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve 'real' chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To acquaint students with issues involved in making decisions in an environmental context. The important example of wastewater treatment and the accompanying technologies will be used to illustrate the main issues which arise. The key issues which need to be considered are : An operational paradigm for the process industries; Why waste is inevitable; The regulatory framework; Hazard rating of process wastes; Physical treatment technologies; Chemical treatment technologies; Biological treatment technologies; Waste containment practices. By the end of this UOS a student should be able to : gain an operational and legal context for waste and specifically wastewater generation and treatment; develop an awareness and comprehensive understanding of technologies (physical, chemical and biological) which may be used as effective treatments for liquid and some solid waste streams, based on process principles; and explore issues pertaining to management of environmental hazards in the process industry.This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught in this course are relevant to the real world practice of chemical engineering across a range of industries.

CHNG5008
Chemical & Biomolecular Engineering Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time, Lectures 4hrs per week, **Prerequisites:** CHNG5801 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Sustainable technologies will be applied for the design of products and processes that maximise resource and energy efficiency, minimise or preferably eliminate waste and cause no harm to the environment. In modern society, engineers equipped with the skills to develop sustainable technologies are tremendously valuable. This unit of study will examine cutting edge examples of sustainable technologies across a broad range of applications relevant to chemical and biomolecular engineering. The delivery of teaching and learning material will be exclusively in project mode. Students will be expected to critically analyse modern engineering processes and improve them, from the ground up if necessary, so that they satisfy the criteria of eco-design. At the completion of this unit of study students should have developed an appreciation of the underlying principles of sustainable engineering and be able to demonstrate they can apply these skills to new and novel situations. Students are expected to develop an integrated suite of problem-solving skills needed to successfully handle novel (and previously unseen) engineering situations, coupled with an ability to independently research new areas and be critical of what is found, and an ability to cope with experimental data, change and uncertainty through critical thinking.

CHNG5112
Found of Chemical Eng Design A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** CHNG5801, CHNG5802, CHNG5805, CHNG5806 **Assumed knowledge:** Enrolment in this unit of study assumes that all core chemical engineering UoS in second and third years, or their equivalent, have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives

In the overall design process, chemical engineers must clearly understand the (often complex) interactions and trade-offs that occur between technical, economic, social and environmental considerations. This UoS builds on concepts in each of these areas introduced in previous years but with an emphasis on their successful integration within a comprehensive design activity.

This design activity is spread over two UoS (Chemical Engineering Design A and B) run in first and second semester. The primary aim in the first UoS is to consider the technical issues - with an emphasis on creating and evaluating a range of alternative options that exist at both the unit operation and complete flowsheet levels. The primary emphasis in the subsequent UoS is on evaluating how non-technical considerations affect the final process design and its operation.

In addition to the above fundamentals, there will be considerable time spent during the semester on advanced topics related to designing chemical processes and associated technological developments.

CHNG5116
Found of Chemical Eng Design B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** CHNG5112 Chemical Engineering Design A **Assumed knowledge:** Enrolment in this unit of study assumes that all core chemical engineering UoS in second and third years, or their equivalent, have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives

In the overall design process, chemical engineers must clearly understand the (often complex) interactions and trade-offs that occur between technical, economic, social and environmental considerations. This UoS builds on concepts in each of these areas introduced in previous years but with an emphasis on their successful integration within a comprehensive design activity.

This design activity is spread over two UoS (Chemical Engineering Design A and B) run in first and second semester. The primary aim in the first UoS is to consider the technical issues - with an emphasis on creating and evaluating a range of alternative options that exist at both the unit operation and complete flowsheet levels. The primary emphasis in this UoS is on evaluating how non-technical considerations affect the final process design and its operation.

In addition to the above fundamentals, there will be considerable time spent during the semester on advanced topics related to designing chemical processes and associated technological developments.

CHNG5205
Major Industrial Placement Project

Credit points: 24 **Session:** Semester 1 **Classes:** Practical Experience and Research with Industry partner. **Prerequisites:** Passed at least 48 credit points in Master of Professional Engineering. **Prohibitions:** CHNG5112, ENGG5219, ENGG5220, ENGG5221, CHNG5801. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Enrollment by permission only. The students enrolled in this subject should complete the first year Master of Professional Engineering with specialisation in Chemical and Biomolecular Engineering and a minimum credit average. The candidate will be selected by interview and at the discretion of the Head of School.

The purpose of this proposal is to introduce a new subject into the Master of Professional Engineering with specialisation in Chemical and Biomolecular Engineering. The new subject is designed to equip students with practical experience in the area of chemical and Biomolecular Engineering. Industrial project placement will clearly cover and widen the practical nature of curriculum base studies. This unit of study will give students a rich experience for undertaking a major project in an industrial environment and developing skills in the preparation and presentation of technical reports. The project is performed under joint university and industry supervision and extends over one semester. The students will be engaged full time on the project at the industrial site. Students will be placed with industries, such as mining, oil and gas processing, plastic and paint manufacturing, food production, wastewater and water treatment. The students will learn essential engineering skills, such as how to examine published and experimental data, set objectives, project management, and analysis of results and assess these with theory and existing knowledge.

CHNG5601
Membrane Science

Credit points: 6 **Session:** Semester 1 **Classes:** 4 hours of lectures and laboratory sessions per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Students will be given a background in the physics of cell membranes. The students will understand the electrodiffusion of materials through membranes. Students will be provided with a good background in the electrical properties of cell membranes and gain an understanding of the process of excitation in nerve and muscle.

CHNG5602
Cellular Biophysics

Credit points: 6 **Session:** Semester 1 **Classes:** 4 hours of lectures/ project work classes per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Students will be given a good background in the physics of biological processes. Students will understand the differences between thermodynamically closed and open systems and its relevance to cells and other biological systems. Students will be provided with an introduction to the thermodynamics of irreversible and evolutionary processes of relevance to biology. Students will be introduced to the statistical mechanics of self assembly and equilibrium structures and its relevance to biology at the molecular level.

CHNG5603
Analysis, Modelling, Control: BioPhy Sys

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2hrs per week, Tutorials 1hr per week, Project Work - own time. **Assumed knowledge:** It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This course will give students an insight into the use of (computer-based) statistical techniques in extracting information from experimental data obtained from real life bio-physical systems. The issues and techniques required for mathematical modeling as well as monitoring and/or control scheme for bio-physical systems will be discussed and implemented in diverse range of bioprocesses, including biomaterials and fermentation products.

We will review statistical distribution; tests based on z, t, F variables; calculation of confidence intervals; hypothesis testing; linear and nonlinear regression; analysis of variance; principal component analysis; and use of computer-based statistical tools. The issues associated with dynamic response of bio-physical processes; inferred or estimated variables; control system design and implementation; introduction to model-based control; use of computer-based control system design and analysis tools will be elaborated.

When this course is successfully completed you will acquire knowledge to choose the appropriate statistical techniques within a computer based environment, such as Excel or MATLAB, for a given situation. The students will also obtain potential for monitoring/control scheme based on the key dynamic features of the process. Such information would be beneficial for any future career in Bio-manufacturing companies. Students are encouraged to promote an interactive environment for exchange of information.

CHNG5604
Membrane Science Laboratory

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures or tutorials per week. 4 hours of laboratory sessions per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Students will explore experimentally the theoretical concepts learned in the other modules of the MES course in Biophysical Processes. They will gain practical insights into electrodiffusion and other mass transport processes through membranes. Students will understand the construction and functional properties of synthetic separation membranes. Students will explore experimentally the various factors affecting the performance of synthetic separation membranes.

CHNG5605
Bio-Products: Laboratory to Marketplace

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures per week. Project Work - own time. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of the course are to provide students with an overview of biochemical and pharmaceutical industry. It will give students an insight into drug delivery systems and formulation; how therapeutic drugs work; and a general overview of biochemical and pharmaceutical marketing. The design and management of clinical trials, which are key factors for development of any new therapeutic agent will also be covered in the course. The challenges for commercialisation of

innovative methods and/or biochemical and pharmaceutical products and aspects of intellectual property protection will be elaborated. Ultimately the aspects of Good Manufacturing Practice (GMP) and international legislation for marketing pharmaceutical products will be illuminated.

Lectures in this course will be delivered by both University of Sydney staff and by a number of visiting professional representatives from industry and government agencies. We will also arrange a site visit for a bio-manufacturing company as warranted.

When you successfully complete this course you acquire knowledge about drug formulation, pharmaceutical processing including physical processes, legislation governing the bio-manufacturing and commercialisation of biochemicals and pharmaceuticals. The information would be beneficial for your future career in pharmaceutical manufacturing companies.

Students are encouraged to engage in an interactive environment for exchange of information. This course will be assessed by quizzes, assignments, oral presentation and final report.

CHNG5701
Found of Conservation & Transport Proc

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2hrs per week, Tutorial 2hrs per week, Project Work - own time, Laboratory 2hrs per week. **Prohibitions:** CHNG2801 **Assumed knowledge:** Calculus, computations (Matlab, Excel), Mass and Energy Balances **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives

In the design and analysis of chemical processes, chemical engineers must understand integrated concepts in conservation of mass and energy, the flow properties of fluids, heat transfer and the mass transfer of chemical species through materials. This is true not only in traditional areas, such as petrochemicals, but also for emerging fields like microreactors and biotechnology. This course is an introduction to the basic concepts in transport phenomena necessary for subsequent courses ranging from unit operations to reactor design and reaction kinetics. The course builds on concepts from elementary physics and chemistry, as well as calculus and differential equations.

This module will provide students with working knowledge of conservation of mass and energy, momentum, mass and energy transfer, and non-reaction rate processes. These aspects are a first step to the understanding of transport phenomena. It considers the classification of fluids and their properties. The integral and differential forms of the fundamental equations - Continuity, Momentum and Energy equations are studied. The concepts of transfer rates of momentum, heat and mass as functions of appropriate driving forces divided by appropriate resistances will be introduced. The way in which such resistances and driving forces are defined will be reviewed. Also covered are dimensional analysis and the differences between molecular diffusion and convection (bulk flow) of mass, heat and momentum.

In addition, there will be considerable time spent during the semester on advanced topics related to the analysis of conservation and transport processes in engineering, and recent associated technological developments.

CHNG5702
Found of Applied Maths for Chem Eng

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Assumed knowledge:** Enrolment in this unit of study assumes that all core science and engineering UoS in first-year (or their equivalent) have been successfully completed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Aims and Objectives

Virtually every aspect of a chemical engineer's professional life will involve some use of mathematical techniques. Not only is the modern chemical engineer expected to be proficient in the use of these techniques, they are also expected to be able to utilise computer-based solutions when analytical solutions are unfeasible. This UoS aims to expose students to an appropriate suite of techniques and enable them to become proficient in the use of mathematics as a tool for the solution of a diversity of chemical engineering problems.

Specifically, this unit consists of two core modules: (A) Statistical methods and (B) Numerical methods. These modules aim at furthering knowledge by extending skills in statistical analysis and Chemical Engineering computations. This unit will also enable the development of a systematic approach to solving mathematically oriented Chemical Engineering problems, which will help with making sound engineering decisions.

In addition, there will be considerable time spent during the semester on advanced topics related to mathematical analysis techniques in engineering and recent associated developments.

CHNG5703
Found of Energy and Fluid Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 8 hours per week of in class project work. **Prohibitions:** CHNG2803 **Assumed knowledge:** Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on qualitative and quantitative information **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To recognise that chemical engineers are involved in creation of products and processes, in manipulating complex systems, and in managing technical operations To develop an appreciation of the practical application of concepts and tools to real design problems in the process, product and service sectors in which chemical engineers are engaged. To consider this through three project-driven case studies covering a range of integrated analysis scenarios, from the domain of energy and fluid systems. In addition, there will be considerable time spent during the semester on advanced topics related to energy and fluid systems and associated technological developments.

CHNG5704
Found: Chem & Biological Syst Behaviour

Credit points: 6 **Session:** Semester 2 **Classes:** 1-2 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** CHNG2804 **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives

Chemical Engineering requires an understanding of material and energy transformations and how these are driven by molecular interactions. The rate of such transformations is dependent on driving forces and resistances, and these need to be defined in terms of fundamental physical and chemical properties of systems.

This course seeks to provide students with a sound basis of the thermodynamics of chemical and biological systems, and how these, in turn, define limits of behaviour for such real systems. The thermodynamic basis for rate processes is explored, and the role of energy transfer processes in these highlighted, along with criteria for equilibrium and stability. Emphasis is placed on the prediction of physical properties of chemical and biological systems in terms of state variables. The course delivery mechanism is problem-based, and examples from thermal, chemical and biological processes will be considered, covering molecular to macro-systems scale.

In addition, there will be considerable time spent during the semester on advanced topics related to the analysis of the behaviour of chemical and biological systems, and recent associated technological developments.

CHNG5705
Found: Industrial Syst & Sustainability

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** CHNG2805 **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these

concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on qualitative information. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To develop an awareness of the various concepts which underpin Sustainable Development, including technical and economic efficiency, stewardship of the bio-physical environment, and social acceptability. To examine the material economy from the perspective of open and closed thermodynamic systems, and the implications of this for resource consumption and waste generation To explore governing frameworks for Sustainability, and engagement of chemical engineers with these. To explore tools and approaches for quantifying industry's environmental performance and how this can be examined within a Sustainability framework. To consider process design and operation, and product design, from a Sustainability perspective, how these can be informed by Green Engineering principles, and to suggest how this combination of perspectives could lead to a re-defined industry sector. To investigate advanced topics related to the areas of industrial systems and sustainability and recent associated technological developments.

CHNG5801
Foundations of Process Design

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** CHNG5701, CHNG5702, CHNG5704, CHNG5705 **Prohibitions:** CHNG3801 **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

In the design and analysis of diverse processes, chemical engineers must understand the (often complex) interactions that occur between mass and energy conservation, fluid flow, rate-driven processes and thermodynamic equilibria. This course builds on introductory concepts in each of these areas introduced in second year units of study. This unit of study will commence with a study of the thermodynamic criteria that define equilibrium conditions with an emphasis on vapour-liquid and reactive systems. A unified treatment of rate-driven processes will then be provided with examples taken from a number of fields. A classification system (steady-state or dynamic; rates based on bulk conditions or a population balance approach; homogeneous or heterogeneous) will be developed. Kinetic rate laws and their determination from experimental data will be presented. The second component will concentrate on (i) using the above to model a range of process equipment, and (ii) the solution of such models (both steady-state and dynamic) using the appropriate software tools. The final component will focus on how unit operations are integrated into a process flowsheet. Software tools for flowsheet solution will be introduced. The impact of heat integration and recycle streams will be considered. Examples will cover a diversity of process industries. In addition to the above fundamentals, there will be considerable time spent during the semester on advanced topics related to process design and associated technological developments. The overall aims of this unit of study are (i) to demonstrate the 'vertical integration' that exists from engineering concepts through unit operations to complete flowsheets, (ii) to demonstrate that a unified approach allows a diversity of fields to be handled via a consistent, common approach, and (iii) to allow each student to achieve and demonstrate acceptable competency over the UoS material through a range of individual and group-based activities.

CHNG5802
Found: Operation & Improving Ind Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** CHNG5701, CHNG5702, CHNG5704 and CHNG5705 **Prohibitions:** CHNG3802 **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives

All industrial processes require some process monitoring and control for satisfactory operation. The efficient use and recovery of energy is vital for industrial processes. The performance of a process may be improved via the implementation of some level of optimisation.

This unit of study commences with a component on process data management before moving on to empirical modelling and data reconciliation techniques. The second component will concentrate on the role of process control covering: the development of linear models, control system analysis, the design and performance of feedback control systems, advanced control systems and the use of control related software.

In parallel, this unit of study also focuses on the efficient use of energy in processes plants.

The final component will focus on process optimisation of batch and continuous processes.

By the end of this UoS a student should achieve competence in the following: process data management skills relevant to engineering (statistical analysis, data-based modelling and data reconciliation techniques); appreciation of the role of process control in modern manufacturing; designing an appropriate feedback control system and analysing its performance for a range of process applications using both traditional and software-based techniques; appreciation of the limitations of feedback control and be able to design a range of common enhancements; appreciation of the role of process optimisation in modern manufacturing; use of both traditional and software-based techniques to design optimisation schemes for a range of process applications and analyse the performance of such schemes; appreciate the limitations that exist whenever mathematical models are used as the basis for process control and/or optimisation; appreciate the 'vertical integration' that exists from modelling, through control, to optimisation.

The overall aims of this UoS are (i) to demonstrate that process control and optimisation are integral concepts in the overall consideration of any modern plant, (ii) to demonstrate that a unified approach allows a diversity of application fields to be readily handled via a consistent approach that is 'vertically integrated' from data analysis, though process control to process optimisation, and (iii) to allow each student to achieve and demonstrate acceptable competency over the UoS material through a range of individual and group-based activities.

CHNG5803
Found of Chem & Biological Processes

Credit points: 6 **Session:** Semester 1 **Classes:** 4 hours of in-class project work per week. **Prerequisites:** CHNG5701, CHNG5702, CHNG5704 and CHNG5705 **Prohibitions:** CHNG3803 **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative and quantitative information **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives

To recognise that chemical engineers are involved in the creation of products and processes, in manipulating complex systems, and in managing technical operations.

To develop an appreciation of the practical application of concepts and tools to real design problems in the process, product and service sectors in which chemical engineers are engaged.

To consider this through three project-driven case studies covering a range of design scenarios, from the domain of chemical and biological processes.

In addition, there will be considerable time spent during the semester on advanced topics related to chemical and biological processes, and associated technological developments.

CHNG5804
Found of Biochemical Eng

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures, 1 hour of tutorials per week. 10 hours of laboratory work per semester. **Prohibitions:** CHNG3804 **Assumed knowledge:** First year mathematics (MATH1001 Differential Calculus; MATH1002 Linear Algebra; MATH1003 Integral Calculus; MATH1005 Statistics; or equivalents). -First year chemistry (CHEM1101 Chemistry 1A; CHEM1102 Chemistry 1B; or equivalents) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives

Biochemical engineering is increasingly playing an important role in technology to modern society. The engineers with knowledge of various aspects of biochemical processes are tremendously valuable. The course will examine cutting edge examples of biochemical technologies across a broad range of applications relevant to chemical engineering. The specific objectives of this course are to understand the history and scope of the biotechnology industry; examine the role of biochemical engineering in the industrial application of biotechnology and its development. We will provide an understanding of the major fundamental aspects of biochemical engineering and implementing the knowledge acquired to some selected industrial applications.

In addition to the above fundamentals, there will be considerable time spent during the semester on advanced topics related to biochemical engineering and associated technological developments.

CHNG5805
Foundation of Prod Formulation & Design

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 1 hours of tutorials per week. **Prerequisites:** CHNG5701, CHNG5702, CHNG5704 and CHNG5705 **Prohibitions:** CHNG3805 **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives

Many products emerge from their processing not as a continuous stream, but as discrete entities. There are many examples of discrete systems in chemical engineering, such as particulate systems (eg powders, solid particles in fluids), as well as polymeric and biological systems (eg emulsions and cells, respectively). Indeed, on a larger scale, a batch processing system itself can be thought of as a series of discrete but connected entities. This course is an introduction to the basic concepts in discrete systems necessary for a chemical engineer to be able to formulate and design discrete products which have desired properties. In essence it is a course on product formulation and design.

This module will provide students with a working knowledge of the types of discrete systems available, the ways in which particulate systems can be characterized and their applications in industry. These aspects will form the foundation for an introduction of the modelling techniques used for discrete systems, such as population balances and batch scheduling.

In addition to the above fundamentals, there will be considerable time spent during the semester on advanced topics related to the formulation and design of a variety of products, as well as the associated recent technological developments.

CHNG5806
Found of Manag of Industrial Syst

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 3 hours of tutorials per week. **Prerequisites:** CHNG5701, CHNG5702, CHNG5704 and CHNG5705. **Prohibitions:** CHNG3806 **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems Ability to understand basic principles of physical chemistry, physics and mechanics Ability to use mathematics of calculus (including vector calculus) and linear algebra, and carry out computations with MATLAB and MS EXCEL. Ability to read widely outside of the technical literature, and to synthesise arguments based on such literature Ability to write coherent reports and essays based on qualitative information **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Aims and Objectives: To develop an appreciation of management practice in process-led and product-driven industries; considering project management, economic evaluation of processes, risk assessment and decision making with multiple objectives and uncertainty; to develop the requisite tools to support above; to consider approaches to innovation and entrepreneurship; to consider all this in the context of different scales of operation - from single process, to business unit, to enterprise, and across supply and value chains; to support this analysis through real-problem case studies and projects. By the end of this unit of study a student should be competent in: developing project work plans in conjunction with project management schedules; performing economic evaluations of projects, plans and processes; performing qualitative risk assessments of projects, plans and processes; exploring optimisation of complex processes under risk and uncertainty, covering unit operations, business units, enterprises and value chains.

CHNG5901
Project Part A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** no formal classes. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

In order to enrol in a project, students must first of all secure an academic supervisor in an area that they are interested in. The topic of your project must be determined in discussion with your supervisor. The supervisor can come from any department, however, if outside the School of Chemical and Biomolecular Engineering, they need to send confirmation of their supervision approval to the Postgraduate Administrator. Only one Project per semester can be taken, however, it can be supplemented with a 2 credit point Seminar in which supplementary work, and an oral presentation related to the Project can be carried out.

CHNG5902
Project Part B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** no formal classes **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

In order to enrol in a project, students must first of all secure an academic supervisor in an area that they are interested in. The topic of your project must be determined in discussion with your supervisor. The supervisor can come from any department, however, if outside the School of Chemical and Biomolecular Engineering, they need to send confirmation of their consent to supervise to the Postgraduate Administrator. Only one Project per semester can be taken, however, it can be supplemented with a 2 credit point Seminar in which supplementary work, and an oral presentation related to the Project can be carried out.

CHNG5906
Extended Project

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** no formal classes. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first of all secure an academic supervisor in an area that they are interested in. The topic of your project must be determined in

discussion with the supervisor. The supervisor can come from any department, however, if outside the School of Chemical and Biomolecular Engineering, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

For the student to complete an extended research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued report.

CHNG5907
Extended and Enhanced Project

Credit points: 24 **Session:** Semester 1, Semester 2 **Classes:** no formal classes. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first of all secure an academic supervisor in an area that they are interested in. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any department, however, if outside the School of Chemical and Biomolecular Engineering, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

To complete an extended and enhanced research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.

School of Civil Engineering

CIVL5257
Concrete Structures: Prestressed

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2hrs per week, Project Work - in class 1hr per week). **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives: To develop an advanced understanding of the behaviour, analysis and design of prestressed concrete structures.

Outcomes: Students will develop skills in the analysis and design of prestressed concrete beams, columns and slabs, to satisfy the serviceability and strength provisions of the Australian Concrete Structures Standard.

Syllabus Summary: The behaviour and design of prestressed concrete structures and structural elements including beams, columns and slabs. Topics covered will include steel and concrete materials, prestress losses, flexural and shear behaviour at service loads and ultimate loads, short and long term deflections, load balancing, anchorage zones (including strut and tie modelling of anchors), dynamic response of post-tensioned floors, and sustainability considerations for prestressed concrete structures.

Textbooks
Reference books:
Warner et al, Concrete structures (Longman)
Australian Standard AS 3600 Concrete Structures

CIVL5264
Composite Steel-Concrete Structures

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures 2hrs per week, Tutorial 1hr per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Students will understand the basic principles for the design of steel-concrete composite structures. In particular, they will develop an understanding of the procedures required for the design of composite beams, slabs and columns; they will also be introduced to the concepts of composite connection design. Design guidelines will reflect requirements of the Australian Standards, Eurocodes, British Standards and American Standards.

Textbooks
References:
AS2327.1:2003, Composite structures - Part 1: Simply supported beams. Sydney: Standards Australia, 2003.
Eurocode 4:2004, EC4 Design of composite steel and concrete structures - Part 1.1: general rules and rules for buildings, British Standards Institution, 2004.
Johnson RP and Anderson D. Designers' handbook to Eurocode 4. Thomas Telford, London, 1993.
Johnson RP. Composite structures of steel and concrete. 3rd edn. Blackwell Scientific Publications, Oxford, UK. 2004.
Nethercot D. Composite construction. Routledge, London, 2003.
Oehlers DJ and Bradford MA. Composite steel and concrete structural members: fundamental behaviour. Pergamon Press, Oxford, 1995.

CIVL5266
Steel Structures - Stability

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hrs of lecture and 2hrs of tutorial/laboratory per week **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives:

This Unit aims to:

- provide fundamental understanding at advanced level of the behaviour and design steel structural members, notably members undergoing cross-sectional and/or global buckling.

- provide fundamental understanding of the methods available for determining buckling loads of structural members and elements, and explain how classical solutions to buckling problems are incorporated in national design standards for steel structures, including AS4100 and AS/NZS4600.

Outcomes:

It is anticipated that at the end of this unit of study students will be familiar with the buckling behaviour of steel structures and will understand the methods available for determining buckling loads of structural members and cross-section. Students will have a good understanding of the stability design provisions for steel structures specified in the standards AS4100 and AS/NZS4600, and will be proficient in using software for calculating buckling loads.

Syllabus Summary:

Stability theory, Plate theory, Stability of plates and plate assemblies, Theory for thin-walled members in torsion and bi-axial bending, Stability of thin-walled members, Stability design to AS4100 and AS/NZS4600, Direct Strength Method.

Textbooks
Lecture notes:
- Lecture notes compiled by Kim Rasmussen and Greg Hancock
Reference Books:
- The Stability of Flat Plates, by PS Bulson, Chatto & Windus, London, 1970.
- Flexural-torsional buckling of steel structures, by NS Trahair, E & FN Spon, 1992.
- NS Trahair, MA Bradford and DA Nethercot, The Behaviour and Design of Steel Structures to BS 5950 Part 1, 3rd Edition, Chapman and Hall, London, 1998.
- GJ Hancock, Design of Cold-Formed Steel Structures to AS/NZS 4600, AISC, 1998.
- GJ Hancock, TM Murray and DS Ellifritt, Cold-Formed steel structures to the AISI Specification, Marcel Dekker, New York, 2001.
- AS 4100: 1998, Steel Structures, Standards Australia, Sydney, 1998.
- AS/NZS 4600: 2005, Cold-formed Steel Structures, Standards Australia, Sydney, 2005.
Relevant Australian Standards
- AS 4100-1998 Steel Structures
- AS 4100-1999 Commentary to AS 4100
- AS/NZS 4600:2005 Cold-formed Steel Structures
Recommended alternative:
- HB 2.2: Australian Standards for Civil Engineering Students, Part 2 - Structural Engineering

CIVL5267
Steel Structures - Advanced Design

Credit points: 6 **Session:** Semester 1 **Classes:** 3-hr combined lecture and tutorial per week **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives:

This Unit covers the advanced principles of the design of hot-rolled and cold-formed steel structural members and connections. Reference is made to the Australian Standards AS4100 and AS/NZS4600, explaining the underlying theory for the provisions of these standards. The objectives are to provide students with advanced knowledge of steel structural design and confidence to apply the underlying principles to solve a wide range of structural steel problems.

Outcomes:

This Unit will provide students with the following knowledge and skills:

- An understanding of the basic principles of reliability based design on steel structures.

- An understanding of the relationship between structural analysis and design provisions.

- An understanding of the background to the design provisions for hot-rolled and cold-formed steel structures, including the main differences between them.

- Proficiency in applying the provisions of AS4100 and AS/NZS4600 for columns, beams, beam-columns and connections.

Syllabus Summary:

Limit states design philosophy and approaches, Loading standards, Methods of analysis, Flexural members section and member capacity, Compression members section and member capacity, Beam-column member and section capacity, Interrelationship between analysis and design, pinned (shear) and rigid (moment) connections.

Textbooks

Lecture notes:
- Advanced Structural Steel Design, compiled by Greg Hancock & Kim Rasmussen

Reference Books
- NS Trahair, MA Bradford and DA Nethercot, The Behaviour and Design of Steel Structures to BS 5950 Part 1, 3rd Edition, Chapman and Hall, London, 1998.
- GJ Hancock, Design of Cold-Formed Steel Structures to AS/NZS 4600, AISC, 1998.
- GJ Hancock, TM Murray and DS Ellifritt, Cold-Formed steel structures to the AISI Specification, Marcel Dekker, New York, 2001.
- AS 4100: 1998, Steel Structures, Standards Australia, Sydney, 1998.
- AS/NZS 4600: 2005, Cold-formed Steel Structures, Standards Australia, Sydney, 2005.
- Australian Steel Institute (ASI), Design of Structural Steel Connections, suite of various design manuals and handbooks.

Library Classifications
624.17, 624.18, 691.7.

CIVL5268
Structural Dynamics

Credit points: 6 **Session:** Semester 2 **Classes:** 3-hr combined lecture and tutorial per week **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives: This Unit introduces the fundamental concepts and theory of dynamic analysis. In a first step, free vibrations are studied and the problem of determining the natural frequency of a system is addressed. This is followed by the study of harmonically excited vibrations. While initially systems with a single degree of freedom (mass) are considered, the theory is generalized to cover multi-degree of freedom systems. The theory is applied to explain how structures are designed against earthquake actions with specific reference to Part 4 of the Australian loading standard AS1170 for determining earthquake loads.

Outcomes: This Unit will provide students with the following knowledge and skills:

Understanding of the fundamental concepts and definitions used in structural dynamics

Ability to calculate the natural frequency of a system using equilibrium or energy methods

Ability to determine the effect of viscous damping on the response of a freely vibrating system

Ability to determine the response of a system to a harmonic excitation

Understanding of the fundamental concepts of earthquake engineering

Ability to apply AS1170 Part 4 in structural design against earthquake actions

Understanding of the fundamental concepts of earthquake engineering

Textbooks

Textbooks:
- Australian New Zealand Standard, Structural Design Actions Part 2: Wind Actions, AS/NZS 1170.2-2002, Standards Australia.
- Australian New Zealand Standard, Structural Design Action - wind actions - commentary (supplement to AS/NZS 1170.2:2002), AS/NZS 1170.2 Supp 1:2002, Standards Australia.
- Australian New Zealand Standard, Structural Design Actions Part 4: Earthquake Actions, AS/NZS 1170.4-2002, Standards Australia.
- Hancock, J.G. (1996). Dynamic Structural Analysis, The University of Sydney, Sydney.
- Notes shall also be handed out during class or available for download from WebCT.

Reference books:
- Cook, N.J., The designer's guide to wind loading of building structures, Part 1: Background, damage survey, wind data and structural classification, Butterworth, 1985.
- Cook, N.J., The designer's guide to wind loading of building structures, Part 2: Static Structures, Butterworth, 1985.
- Holmes, J.D., Wind Loading of Structures, Spon Press, 2001.
- Kwok, K.C.S. Wind induced vibrations of structures, Chapter 6, Structures subjected to dynamic loading, stability and strength, Ed. Narayanan R., and Roberts, T.M., Elsevier Applied Science, 1991.
- Lawson, T.V., Wind effects on buildings, Vol. 1 Design Applications, Applied Science Publishers, 1980.
- Lawson, T.V., Wind effects on buildings, Vol. 2 Statistics and Meteorology, Applied Science Publishers, 1980.
- Simiu, E. and Scanlan, R.H., Wind effects on structures, John Wiley and sons, 1996.
- Anil K. Chopra, Dynamics of Structures, Prentice Hall, 2001

CIVL5269
Concrete Structures - Strength & Service

Credit points: 6 **Session:** Semester 2 **Classes:** 4-hr combined lecture and tutorial per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives:

This Unit reviews the fundamental concepts of 'elastic' behaviour of reinforced concrete structures and introduces models of behaviour and methods of analysis related to the time-dependent effects of creep and shrinkage (at service loads). This Unit also examines the non-linear (strain-softening) behaviour of reinforced concrete and the related effects concerning the strength of statically-indeterminate reinforced concrete structures. In particular, this Unit examines the concepts of ductility, moment-redistribution and plastic design (for beams and slabs).

Outcomes:

This Unit will provide students with the following knowledge and skills:

- understanding of the fundamental concepts and theoretical models concerning the time-dependent structural effects of concrete creep and shrinkage

- ability to carry out calculations to estimate 'elastic' load-effects (stresses/strains/deformations) for reinforced concrete structures (at service loads), accounting for the time-dependent effects of concrete creep and shrinkage

- understanding of the fundamental concepts and theoretical models of the strain-softening behaviour of reinforced concrete (in flexure)

- understanding of the fundamental concepts and numerical models of ductility and moment redistribution for reinforced concrete beams

- ability to quantitatively assess the ductility and moment-redistribution capacity of reinforced concrete beams

- understanding of the fundamental concepts and numerical models of plastic behaviour and design for reinforced concrete beams and slabs (including yield-line analysis).

- ability to determine the ultimate plastic load-carrying capacity of statically-indeterminate reinforced-concrete beams and slabs

Textbooks

Textbooks:
Australian Standards - current editions
- AS3600 Concrete Structures Code
- AS HB2.2 Structural Engineering Standards

Reference Books:
- Wight JK & MacGregor JG, Reinforced Concrete: Mechanics and Design, Fifth edition, Pearson Prentice Hall, 2009.
- Warner RF, et al., Concrete Structures, Longman, 1998.

CIVL5351
Environmental Geotechnics

Credit points: 6 **Session:** Semester 1 **Classes:** 4 hours of lectures/project work per week **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives: To develop an understanding of the geotechnical aspects of the design and management of industrial and domestic waste disposal systems. Outcomes: Students should gain an advanced understanding of: the role of geotechnics in the design of waste management systems; current design methods and technologies. In particular, they should be able to predict: likely interactions between

waste and soil; of pollutant movement in the ground, and be able to evaluate strategies for the containment of industrial and domestic wastes and mine tailings. Syllabus summary: Landfill design, including clay mineralogy, effects of chemicals on soil permeability, flow rates through membranes, effect of punctures, composite liners, mechanisms of mass transport, diffusion, dispersion, advective transport, sorption, predicting transport time, solutions to advection-dispersion equation, design of liners, stability of clay liners on slopes, design of covers, infiltration rates. Tailings disposal, including types of tailings dams, design of dams, water balances, rehabilitation, use of slope stability and seepage software.

CIVL5450
Analysis and Design of Pile Foundations

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lecture/project work in class per week. 3 hours of laboratory work per semester. **Assumed knowledge:** BE or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives: To develop an understanding of the modern principles of design of pile foundations and the application of those principles to practice.

Expected outcomes: Students should gain an advanced understanding of the types of pile foundations used in practice, and the procedures for analysis of pile foundations under various types of loading, and gain experience in carrying out pile design for real geotechnical profiles.

Syllabus summary: Types of piles and their uses, effects of pile installation, axial capacity of piles and pile groups, settlement of pile foundations, ultimate lateral capacity, lateral deformations, analysis of pile groups subjected to general loading conditions, piled raft foundations, piles subjected to ground movements, pile load testing, code provisions for pile design.

CIVL5451
Computer Methods in Geotechnical Eng

Credit points: 6 **Session:** Semester 1 **Classes:** 3-hr combined lecture and tutorial per week **Assumed knowledge:** BE or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives and Outcomes

1. To introduce students to major computer modelling techniques used to solve boundary-value and initial-value problems in geotechnical engineering.

2. To develop students' skills at using computer modelling software to solve stress and flow problems in geomechanics.

3. To developed students ability at critically assessing assumptions behind computer models and critically evaluating the quality of numerical results.

Textbooks

Reference Books:
1. Potts DM and Zdravkovic L. 1999. Finite element analysis in geotechnical engineering. Thomas Telford, London.
2. Smith IM and Griffiths DV. 1982. Programming the finite element method, second edition, John Wiley & Sons, Chichester.
3. Zienkiewicz OC. 2005. The finite element method and structural mechanics. 6th edition, Elsevier Butterworth Heinemann, Amsterdam.

CIVL5452
Foundation Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures 3 hrs per week, presented in 2 sessions per week for 11 weeks of semester. Tutorials 1hr per week. **Assumed knowledge:** BE or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to gain an understanding of the design process in foundation engineering, to understand the importance of site investigation and field testing, and to learn how to deal with uncertainty. To achieve these objectives students are asked to design foundations using real data. Students will develop the ability to interpret the results of a site investigation; to use laboratory and field data to design simple foundations; develop an appreciation of the interaction between the soil, foundation system and the supported structure. The syllabus is comprised of field testing, site characterisation, interpretation of field data, design of pile raft and surface footings, support of excavations, soil improvement, and geotechnical report writing.

Textbooks

REFERENCE: Das B.M.,Principles of Foundation Engineering, Thomson, Edn:6th,2007,0-495-08246-5
REFERENCE: Tomlinson, M.J.,Foundation Design and Construction, Pitman, Edn:6th,1995,0-582-22697-X
REFERENCE: Peck, Hanson and Thornburn,Foundation Engineering, John Wiley, Edn:2nd,1973,0-471-67586-5
REFERENCE: Poulos H.G. and Davis E.H.,Pile Foundation Analysis and Design, John Wiley,
Edn:1st,1980,0-471-02084-2
REFERENCE: Fleming, Weltman, Randolph and Elson,Piling Engineering, Halsted Press, Edn:2nd,1994,0419161805

CIVL5454
Rock Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of project work in class per week **Assumed knowledge:** Undergraduate geology and soil mechanics. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives: to develop an understanding of the behaviour and design of engineering structures in rock masses.

Expected outcomes: Students will have learnt how to classify and characterise rocks and rock masses for engineering purposes and developed an understanding of basic rock mechanics etc.

Syllabus summary: Introduction to rock mechanics and rock engineering. Index properties and engineering characterisation of rocks and rock masses. Planes of weakness in rock masses. Rock material strength and rock mass strength. Rock deformability. In situ stress conditions in rock masses. Underground openings. Rock slopes.

Textbooks

TEXTBOOK: Hoek, E. and Brown, E.T. ,Underground Excavations in Rock, Institution of Mining and Metallurgy, Edn:,1980,
TEXTBOOK: Brady, B.H.G. and Brown, E.T,Rock Mechanics for Underground Mining, George Allen & Unwin, Edn:,1985,
TEXTBOOK: Hoek, E. and Brady, J.,Rock Slope Engineering, Institution of Mining and Metallurgy, London., Edn:3rd,1981,
TEXTBOOK: Bieniawski, Z,Rock Mechanics Design in Mining and Tuneling, A.A Balkema, Rotterdam., Edn:,1984,

CIVL5455
Engineering Behaviour of Soils

Credit points: 6 **Session:** Semester 2 **Classes:** Independent Study 4 hrs per week. Lectures 2hrs per week 12 weeks of semester. Tutorials 1hr per week. **Assumed knowledge:** BE or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objective of the course is to provide an introduction to the critical state framework. This framework is used for the basis for developing an understanding of the stress, strain, strength behaviour of all soils, and is used to present a rational approach to the selection of parameters for use in geotechnical design.

Textbooks

REFERENCE: Atkinson J.H. and Bransby P.L.,The mechanics of soils. An introduction to critical state soil mechanics, McGraw-Hill, Edn:,1978.
REFERENCE: Wood D.M., Soil behaviour and critical state soil mechanics, Cambridge University Press, Edn:,1990.
REFERENCE: Mitchell J.K.,Fundamentals of soil behaviour, John Wiley, Edn:2nd,1993.

CIVL5458
Numerical Methods in Civil Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 4 hrs lecture, tutorial and laboratory per week **Assumed knowledge:** BE or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objective of this unit is to provide students with fundamental knowledge of finite element analysis and how to apply this knowledge to the solution of civil engineering problems at intermediate and advanced levels.

At the end of this unit, students should acquire knowledge of methods of formulating finite element equations, basic element types, the use of finite element methods for solving problems in structural, geotechnical and continuum analysis and the use of finite element

software packages. The syllabus comprises introduction to finite element theory, analysis of bars, beams and columns, and assemblages of these structural elements; analysis of elastic continua; problems of plane strain, plane stress and axial symmetry; use, testing and validation of finite element software packages; and extensions to apply this knowledge to problems encountered in engineering practice.

Outcomes:

On completion of this unit, students will have gained the following knowledge and skills:

1.Knowledge of methods of formulating finite element equations. This will provide students with an insight into the principles at the basis of the FE elements available in commercial FE software.

2.Knowledge of basic element types. Students will be able to evaluate the adequacy of different elements in providing accurate and reliable results.

3.Knowledge of the use of finite element methods for solving problems in structural and geotechnical engineering applications. Students will be exposed to some applications to enable them to gain familiarity with FE analyses.

4.Knowledge of the use of finite element programming and modeling.

5.Extended knowledge of the application of FE to solve civil engineering problems.

Textbooks

- Cook RD, Malkus DS, Plesha ME, Witt RJ, Concepts and Applications of Finite Element Analysis , Wiley , 4th Edn,

CIVL5501

Foundations of Materials

Credit points: 6 **Session:** Semester 1 **Classes:** 4 hours of lectures and 2 hours of tutorials per week **Prohibitions:** CIVL2201 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Materials are an important part of the civil engineers' work. Indeed, civil engineers who are concerned with the design, construction, and maintenance of facilities need to understand the behaviour and performance of the materials used. And as it happens, mechanical properties - which are essential and basic for civil engineers - are highly dependent on the structure of materials at various scales. Therefore, it is important that a student in Civil Engineering possesses a fundamental knowledge in materials science. This unit of study aims to provide students with the tools necessary to select the adequate material for a particular application and to assess its mechanical behaviour while in use. This course will focus mainly on materials for civil engineering and construction applications, i.e. metals, concrete and soils.

CIVL5502

Foundations of Structural Mechanics

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week, 2 hours of laboratory work per semester **Prohibitions:** CIVL2201 **Assumed knowledge:** Students should be competent in the following areas. 1. The concept of force and momentum equilibrium in two and three dimensions. 2. Drawing free body diagrams. 3. Establishing and solving the equations of equilibrium from the FBD. 4. Setting out solutions logically, clearly and neatly. Students should be competent incertain mathematical skills. 1. Solving algebraic equations. 2. Differentiation and integration (including double integrals). 3. Drawing graphs of polynomials (especially) and other mathematical function. 4. Trigonometry. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

The primary objective of this unit is to understand internal actions (forces and moments) in structures (deformable objects) under loads in three key areas: how structures resist external loads by internal actions; the distribution of internal actions within structures; and the deformations, stresses and strains associated with the internal actions. The syllabus comprises introduction; equilibrium; internal actions: BMDs, SFDs, AFDs, and TMDs; elasticity, stress and strain, and basic material properties; axial forces: tension and compression; elastic bending of beams; shear force and shear stresses in beams; torsion; deflection of beams; pipes and pressure vessels; trusses; material properties, combined stresses and yield criteria; advanced bending; introduction to buckling and instability.

Textbooks

Reference: JL Meriam and LG Kraig ,Engineering Mechanics - Volume 1
Textbook: Wilkinson T,Structural Mechanics, Pearson Ed, Edn:2e,2007

CIVL5504

Foundations of Soil Mechanics

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 1 hour of tutorial per week. 10 hours of laboratory work per semester. **Prohibitions:** CIVL2410 **Assumed knowledge:** CIVL5502 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

This course provides an elementary introduction to Geotechnical Engineering, and provides the basic mechanics necessary for the detailed study of Geotechnical Engineering. This course aims to provide an understanding of: the nature of soils as engineering materials; common soil classification schemes; the importance of water in the soil and the effects of water movement; methods of predicting soil settlements, the stress-strain-strength response of soils, and earth pressures.

CIVL5505

Foundations of Intro. Fluid Mechanics

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. 8 hours of laboratory work per semester. **Assumed knowledge:** Students are expected to have a strong understanding of fundamental physics, statics, equilibrium, forces, and dimensional analysis. Familiarity with simple calculus, partial differential equations, and the analytical and numerical solutions. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

The objective of this unit of study is to develop an understanding of basic fluid concepts for inviscid and incompressible fluids. Topics to be covered will include: basic fluid properties, hydrostatics, buoyancy, stability, pressure distribution in a fluid with rigid body motion, fluid dynamics, conservation of mass and momentum, dimensional analysis, open channel flow, and pipe flow. This core unit of study forms the basis for further studies in the applied areas of ocean, coastal and wind engineering and other elective fluid mechanics units which may be offered.

CIVL5506

Foundations-Eng Construction & Surveying

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. 18 hours of practical exercises per semester. **Practical field work:** Notes In recent years - the course has included a 1.5 day camp at Webbs Creek (about 80km from Sydney). The camp is located in a bushland setting. It aims to provide valuable practice in practical field survey and has a secondary aim of providing a basis for social gathering (this aspect being requested in student feedback over recent years) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

The objectives of this unit are to gain an understanding of the fundamentals of engineering construction including - design, control, management, measurement and construction methods for excavation, embankments and other earthworks, hauling and associated operations. - building construction fundamentals, including reinforced concrete, masonry, steel and timber. - drilling and blasting Engineering Survey topics aim (a) to provide basic analogue methods of distance, angle and height measurement and (b) to provide an understanding of three dimensional mapping using basic total station electronic field equipment with associated data capture ability and (c) to give an insight into future trends in the use of GPS and GIS systems.

At the end of this unit, students should develop basic competency in earthwork engineering and economic optimisation of related construction, including proposing and analysing systems and methods, estimation of probable output, unit cost and productivity evaluation. Students should have a basic knowledge of vertical construction in

reinforced concrete, masonry, steel and timber. Students should also develop proficiency in the design and implementation of mapping systems in Civil Engineering, using analogue and electronic field equipment and associated software packages. The syllabus comprises introduction to the framework under which construction projects are formulated and analysed; construction engineering fundamentals; construction systems related to excavation, hauling and embankment construction, including selection and evaluation of plant and methods as well as the expected output and cost; introduction to construction operations management. Introduction to engineering surveying, distance measurement, angle measurement, levelling, traversing, topographic surveys, electronic surveying equipment, future surveying technologies.

CIVL5507
Foundations of Concrete Structures 1

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 3 hours of project work in class per week. 2 hours of laboratory demonstration per semester. **Assumed knowledge:** CIVL5501, CIVL5502, CIVL5509. Stress-strain relationships for steel and concrete; concepts of force equilibrium, compatability of strains, and elastic beam theory. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background

The objectives of this unit are to provide a basic understanding of the behaviour of reinforced concrete members and structures; to provide a basic understanding of standard methods of analysis and design of reinforced concrete behaviour (including an understanding of capabilities and limitations); and to provide basic design training in a simulated professional engineering environment.

The syllabus comprises the behaviour of reinforced concrete members and structures, including: material properties, 'elastic' analysis (stresses/deformations/time-dependence), ultimate strengths of beams (flexure), ultimate strength of columns (short and slender), behaviour or reinforced concrete slabs. The reinforced concrete truss analogy (shear/torsion/and detailing implications). Design of typical elements of a reinforced concrete building, structural modelling, analysis of load-effects (incl.earthquakes), design criteria (for durability, fire-resistance, serviceability and strength), design calculation procedures, reinforcement detailing, structural drawings.

At the end of this unit students will gain proficiency in basic methods of reinforced concrete analysis and design.

CIVL5508
Foundations of Steel Structures 1

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 3 hours of tutorials per week. 2 hours of laboratory work per semester. **Assumed knowledge:** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL2230 Introduction to Structural Concepts and Design as well as knowledge of the content in CIVL3235 Structural Analysis. It is assumed that students are competent in the following areas: the methods of load transfer in structures tension, compression, bending, shear, torsion, and bearing; an appreciation of stress and strain, and being able to determine stresses and strains in simple sections under axial force, bending moments, shear and torsion; calculating and understanding the physical significance of geometric section properties : centroid, Ix, Iy, Zx, Zy, Sx, Sy, rx, ry, J, Ag; knowledge of the basic elastic-plastic material properties of steel, E, G, fy, fu; and knowledge of loading of structures. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

This unit of study is concerned with the behaviour and design of steel structures. Statics provided the fundamentals of equilibrium upon which most structural engineering is based. Structural Concepts and Structural Analysis provided information on the loads (actions) on a structure and how structures resist these actions with a resulting distribution of internal actions (bending moments, shear forces, axial forces; BMDs, SFDs and AFDs). Structural Mechanics considered how these internal actions resulted in stresses and strains in members. Materials considered the microscopic and molecular structure of metals to determine its inherent mechanical properties such as yield stress. This unit of study will then combine the knowledge of stresses, material properties of steel, structural analysis, and loading, and consider new concepts and modes of failure, such as local and flexural torsional buckling, combined actions and second-order effects to understand the behaviour of steel members and frames, and how this behaviour is accounted for in the design standard AS 4100. Both the units of study Steel Structures 1 and Concrete Structures 1 can be considered the culmination of the various elements of structural engineering begun in Engineering Mechanics in first year, and is further developed in Civil Engineering Design in final year. More advanced topics, such as plate behaviour, advanced buckling and connection design, are considered in the final year elective subject Steel Structures 2. It is recognised that not all students intend to become consulting structural engineers. The unit of study is designed so that students who make an effort to understand the concepts are most capable of passing. Students who are planning a career in the consulting structural engineering profession should be aiming at achieving a Distinction grade or higher.

CIVL5509
Foundations of Struct Concepts & Design

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lectures and 2 hours of tutorials per week. **Assumed knowledge:** CIVL5501, CIVL5502, ENGG1802. Structural mechanics, first year mathematics. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

The objectives of this unit are to understand the mechanical properties of the materials used in civil engineering and to show the relation between the methods of manufacture, the resulting microstructures and the mechanical responses.

CIVL5510
Foundations of Civil Engineering Design

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures and 3 hours of tutorials per week. **Assumed knowledge:** CIVL3205 and CIVL3206 or equivalent **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

The UoS aims to develop students' ability to apply engineering fundamentals and the underlying science and mathematics to engineering problem solving. Students are encouraged to exercise critical decision making in developing solutions to challenges and to develop their own philosophical understanding of the design process. The concept covered in this UoS are: the design cycle from problem definition, through concept development, generation of ideas, analysis of proposals, feasibility evaluation, preferred solution selection to the detailed development and documentation of a final design.

Textbooks
n/a

CIVL5511
Foundations of Fluid Mechanics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2hrs per week, Tutorial 2hrs per week, Laboratory 2hrs per week. **Assumed knowledge:** This unit of study assumes previous study of the fundamental principles of fluid dynamics obtained from CIVL5505 Foundations of Fluid Mechanics and Inviscid Flow or equivalent introductory fluid mechanics subject. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study builds on previous study of the principles of fluids dynamics and introduces applied fluid mechanics. The unit provides the theory and tools to solve practical problems related to: differential relations for fluid flow, pipe flow, flow around immersed body, flow around immersed bodies, open channel flow, compressible flow, and turbo-machinery.

CIVL5512
Foundation of Eng Design & Construction

Credit points: 6 **Session:** Semester 1 **Classes:** Workshop 3 hours per week. Lecture/Presentation 2 hrs per week, **Assumed knowledge:** Basic knowledge of construction operations including excavation, embankments and other earthworks, hauling and associated procedures - drilling and blasting, survey,

reinforced concrete construction (including formwork and formwork substitutes), interpretation of engineering drawings. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to develop an understanding of construction methods, strategies, equipment and machinery in a range of construction activities and an understanding of the principles involved in the design for those construction activities. At the end of this unit, students will have developed a familiarity with a variety of construction methods, strategies, equipment and machinery in a range of construction activities such that they will be able, if and when the opportunity arises to participate as site engineers (or similar role) in the planning and execution of those construction activities, albeit with supervision and guidance from experienced professionals. Students will also have developed an understanding of the design principles and techniques involved in the planning for those construction activities such that they are able, if and when the opportunity arises, to participate as design engineers, in the planning and design for those construction activities, with supervision and guidance from experienced professionals. The range of topics covered in this course is such that the learning outcomes form a basis for later development of more detailed knowledge, dependent on the future career experiences of the student. The course does not prepare a student for immediate, unsupervised participation in construction and design work associated with the topics covered. The construction topics covered in this course have not been previously addressed in CIVL5506 (Foundations of Engineering Construction and Survey) or equivalent introductory study of construction and surveying techniques. The topics may vary dependent on current and planned projects in Sydney, NSW and Australia. At this stage the topics are hard rock tunnelling and general hard rock underground excavation; soft ground tunnelling; underground construction; micro tunnelling; cut and cover (cover and cut) tunnelling; earth retaining systems; piling; formwork and falsework (incl Tilt up, Ultrafloor, Sacrificial form); dewatering; pavement design and construction - rigid and flexible (incl and pavement construction materials); stormwater drainage design and construction; marine construction; civil construction in environmentally sensitive areas; contract administration for construction engineers; general engineering in remote localities (project based); construction methods in bridge engineering; QA documentation on a typical project; insurance in the construction industry occupational health and safety issues in the construction industry.

CIVL5513
Foundations of Structural Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 4 hours per week, Tutorial 2 hours per week. **Assumed knowledge:** This unit of study assumes previous study of the fundamental principles of structural mechanics obtained from CIVL5502 Foundations of Structural Mechanics or equivalent introductory structural mechanics subject. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to provide an understanding of the principles of structural analysis by introducing the strain-displacement, stress-strain and equilibrium relationships for beam members; applying the relationships to the matrix displacement analysis of frame structures; and using computer software to conduct the linear-elastic and buckling analyses of frame structures.At the end of this unit, students will be able to deduce appropriate structural models for frame structures; and use computer methods and simple hand methods to obtain internal forces and displacements as well as buckling loads for frame structures. The syllabus comprises theoretical background (strain-displacement, stress-strain and equilibrium relationships), structural analysis software, matrix displacement method, beam theory, introduction to nonlinear analysis, buckling analysis.

Textbooks
n/a

CIVL5514
Foundations of Geotechnical Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs per week, Tutorial 2 hrs per week. **Assumed knowledge:** Fundamentals of soil mechanics including effective stress, pore pressure, consolidation and seepage. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objectives of this unit are to provide an understanding of the factors influencing soil strength, and to give practice in the application of this understanding by exploring the stability of slopes, retaining walls and foundations. At the end of this unit students will be able to: determine the strength parameters appropriate to a range of stability problems, and understand the difference between total and effective stress approaches; evaluate strength parameters from laboratory data; critically analyse foundation stability and slope stability problems; use spreadsheets to perform parametric studies and produce design charts for simple geotechnical design problems; and communicate the results of experiments and analyses using written methods appropriate for professional geotechnical engineers. The syllabus comprises; methods of analysis for gravity and sheet pile retaining walls; reinforced soil; slope stability, including modes of failure, analysis and computer methods; bearing capacity of shallow foundations under general loading, and axial and lateral capacities of deep pile foundations; the mechanical behaviour of sands and clays; the Cam Clay model and the breakage model.

CIVL5515
Foundations of Ocean and Coastal Engg

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 4 hrs per week, Tutorial 2 hrs per week, E-Learning.. **Assumed knowledge:** Fundamentals of fluid mechanics. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The objectives of this unit of study are to develop an understanding of the physics of ocean waves at any water depth and its application to the analysis and design of marine structures. This unit of study introduces the governing equations for free surface flows, including linear and nonlinear wave theories, wave transformation physics and nearshore hydrodynamics modelling. Furthermore, this unit of study includes the calculation of wave forces based on deterministic and probabilistic wave theories, wave-induced coastal currents and sediments, wind-wave-structure interactions, tides, ocean engineering operational sea state, storm surges (due to cyclones and tsunamis) and various other environmental effects. Many marine structure design applications are introduced, including jetties, harbours, breakwaters, bridge piers, dams, offshore platforms, turbines and other wind/wave energy devices. The major outcomes of this unit of study are (i) an understanding of wave physics at any water depth and the criteria for choosing the appropriate wave theory, and (ii) the ability to apply this understanding to the analysis and design of engineering marine structures. Although the unit has an analytical focus, the use of model scale, computational techniques and code of practice based design are also discussed.

CIVL5665
Advanced Water Resources Management

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 1 hour of tutorials per week **Assumed knowledge:** Basic calculation skills and a knowledge of the application of spreadsheets to perform data manipulation and presentation. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to provide an understanding of:
-dispersion in rivers and the coastal ocean
-water supply networks and systems
-wastewater reuse and applications
-surface runoff assessment
-design procedures for storage and service reservoirs
-reservoir safe yield
-physical, biological and chemical treatment methods for wastewater
-management principles for water resources
-irrigation demands
-desalination methods and appropriate applications
-stormwater harvesting
-environmental considerations for water catchment areas
-water conservation principles

CIVL5666
Open Channel Flow & Hydraulic Structures

Credit points: 6 **Session:** Semester 1 **Classes:** 3-hr combined lecture and tutorial per week **Assumed knowledge:** BE or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives:

This unit of study will review the principles of uniform flow in open channels. These will be extended into a study of the principles of slowly varying and rapidly varying flow, the calculation of backwater curves and hydraulic jumps. These principles will then be applied to the design of gutters, inlets, culverts and piers, using existing commercially available software packages commonly used in engineering practice.

Outcomes:

This Unit will provide students with a strong back ground in open channel flow hydraulics, and the basis for the calculation of stream and hydraulic structure performance. Students will gain experience in the use of currently available commercial software for the design of culverts and other structures

Textbooks

Textbooks:
- Sturm, T.W. Open Channel Flow. McGraw Hill 2001

Reference Books:
- Chanson, H.The hydraulics of open channel flow - an introduction. Buttworth-Heinmann. 2004 (2nd ed)
- Munson, B.R., Young, D.F., Okiishi, T.H. and Huebsch, W.W. Fundamentals of Fluid Mechanics. Wiley 2009 (6th ed)

CIVL5668
Wind Engineering for Design-Fundamentals

Credit points: 6 **Session:** Semester 1 **Classes:** 3-hr combined lecture and tutorial per week **Assumed knowledge:** BE or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives:

This unit of study will introduce the fundamentals of meteorology governing wind flow, details of extreme wind events, wind structure, statistical distribution of the wind, the effect of topography and terrain changes on wind profile, investigate the fluid flow around bluff bodies, and detail the design of civil engineering structures for wind loading

Outcomes:

This Unit will provide students with the following knowledge and skills:

On completion of this course students will have an understanding of the governing principles of wind engineering, how to predict the extreme wind speed and analyse anemographs, predict the effect of terrain and topography on velocity and turbulence, understand flow patterns around bodies, how to predict the pressure distribution and wind loading on bodies and structures, and how all the above relates toAS1170.2.

Textbooks

Textbooks:
- Standards Australia.
- Australian New Zealand Standard, Structural Design Action (wind actions) commentary (supplement to AS/NZS 1170.2:2002), AS/NZS 1170.2 Supp 1:2002, Standards Australia.
- Engineering Science Data Units series Wind Engineering (on-line)

Reference Books:
- Wind Engineering Course Notes, Ed. Melbourne, W.H., Department of Mechanical Engineering, Monash University, 1997.
- Cook, N.J., The designer's guide to wind loading of building structures, Part 1: Background, damage survey, wind data and structural classification, Butterworth, 1985.
- Cook, N.J., The designer's guide to wind loading of building structures, Part 2: Static Structures, Butterworth, 1985.
- Holmes, J.D., Wind Loading of Structures, Spon Press, 2001.
- Kwok, K.C.S. Wind induced vibrations of structures, Chapter 6, Structures subjected to dynamic loading, stability and strength, Ed. Narayanan R., and Roberts, T.M., Elsevier Applied Science, 1991.
- Lawson, T.V., Wind effects on buildings, Vol. 1 Design Applications, Applied Science Publishers, 1980.
- Simiu, E. and Scanlan, R.H., Wind effects on structures, John Wiley and sons, 1986.
- Engineering Science Data Units series Wind Engineering (on-line)

Reference Books:
- Wind Engineering Course Notes, Ed. Melbourne, W.H., Department of Mechanical Engineering, Monash University, 1997.
- Cook, N.J., The designer's guide to wind loading of building structures, Part 1: Background, damage survey, wind data and structural classification, Butterworth, 1985.
- Cook, N.J., The designer's guide to wind loading of building structures, Part 2: Static Structures, Butterworth, 1985.
- Holmes, J.D., Wind Loading of Structures, Spon Press, 2001.
- Kwok, K.C.S. Wind induced vibrations of structures, Chapter 6, Structures subjected to dynamic loading, stability and strength, Ed. Narayanan R., and Roberts, T.M., Elsevier Applied Science, 1991.
- Lawson, T.V., Wind effects on buildings, Vol. 1 Design Applications, Applied Science Publishers, 1980.
- Simiu, E. and Scanlan, R.H., Wind effects on structures, John Wiley and sons, 1986.

CIVL5669
Applied Fluid Engineering Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr per week, Tutorial 1hr per week, Laboratory 2hrs per week. **Assumed knowledge:** Understanding of fluid mechanics at the undergraduate level; Appreciation of fluid flow problems relevant to Civil and Environmental Engineering applications; Basic computer skills and some understanding of numerical methods. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives:

The objective of this unit is to provide students with advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving fluid and thermal flow problems relevant to Civil and Environmental Engineering applications. Students will also gain experience in using a state-of-the-art commercial CFD package and advanced understanding of a range of engineering problems through working on projects.

Outcomes:

On completion of this unit, students will have gained the following knowledge and skills:

1.Advanced understanding of CFD procedures.

2.Understanding of advanced CFD approaches for dealing with turbulent and free surface flows as well as other challenging fluid flow problems.

3.Ability to use a state-of-the-art commercial CFD package to solve engineering problems.

4.Skills to formulate and solve engineering problems using CFD techniques, to assess the problems based on CFD calculations, and to write reports accordingly.

5.Advanced understanding of a range of fluid flow problems relevant to Civil and Environmental Engineering applications.

Textbooks

Reference Books:
1.J.D. Anderson (1995) Computational Fluid Dynamics (1st Edition), McGraw-Hill.
2.B.R. Munson, D.F. Young & T.H. Okiishi (2006) Fundamentals of Fluid Mechanics (5th Edition), Wiley.
3.F.P. Incropera, D.P. DeWitt, T.L. Bergman & A.S. Lavine (2007) Fundamentals of Heat and Mass Transfer (6th Edition), Wiley.
4.J.D. Holmes (2007) Wind Loading of Structures (2nd Edition), Taylor & Francis.
5.C. Dyrbye & S.O. Hansen (1996) Wind Loads on Structures, Wiley.
6.B.M. Sumer & J. Fredsoe (1997) Hydrodynamics around Cylindrical Structures, World Scientific.
7.M.H. Chaudhry (2008) Open-Channel Flow (2nd Edition), Springer.
8.P.D. Bates, S.N. Lane & R.I. Ferguson (Editors, 2005) Computational Fluid Dynamics: Applications in Environmental Hydraulics, Wiley.

CIVL5670
Reservoir Stream & Coastal Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hours per week, Tutorials 2 hours per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The objectives of this Unit of Study are to develop an understanding of the processes occurring in lakes, reservoirs, streams and coastal seas, and an introduction to transport and mixing in inland waters, and to the design the design of marine structures. The unit will cover the mass and heat budget in stored water bodies, mixing, and the implications for water quality. In streams, simple transport models will be introduced, and simple models for dissolved oxygen transport discussed. The basic equations for linear and non linear wave theories

in coastal seas will be introduced, and wave forces on structures and an introduction to design of offshore structures will be discussed.

CIVL5901
Civil Engineering Project 1

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** project work - own time. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Involves carrying out some original research work on a topic. The results of the research are reported in a project thesis. This can be combined with CIVL5902, to form a 12 credit point research project.

CIVL5902
Civil Engineering Project 2

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** project work - own time **Corequisites:** CIVL5901 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This UoS is a 6 credit point UoS and involves carrying out some original research work on a topic. The results of the research are reported in a project thesis. This can be combined with CIVL5901, to form a 12cr point research project.

CIVL5903
Major Project A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project work - own time **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This Unit is associated with the following Civil Engineering courses: MES, MES StructsFound., MES FluidWind, MES Structs, MES Geotech., MES EnvirFluid, DIP Structs, DIP Geotech., DIP StructsFound., CERT GGM.

It involves carrying out original research work on a chosen topic at a more advanced level than is required for the 6 credit point Project. The work can be combined with CIVL5904 to form a 24 credit point Project.

CIVL5904
Major Project B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** project work - own time **Corequisites:** CIVL5903 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This UoS is a 12 cr point Uos and involves carrying out original research work on a chosen topic at a more advanced level than is required for the 6 credit point project (CIVL5901 and 5902). The work can be combined with CIVL5903 to form a 24 credit point Project

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Early, Winter Main **Classes:** Session 1: Block Mode, Session 2: Online and Block Mode, Winter and Summer **Campus:** Camperdown/Darlington **Mode of delivery:** Block Mode

Project Management processes are what moves the project from initiation through all its phases to a successful conclusion. This course takes the project manager from a detailed understanding of process modelling through to the development and implementation of management processes applicable to various project types and industries and covers approaches to reviewing, monitoring and improving these processes.

Textbooks
Information Technology Project Management by Kathy Schwalbe

PMGT5872
People and Leadership

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: Block mode & on-line; Session 2: Block mode **Campus:** Camperdown/Darlington **Mode of delivery:** Block Mode or On-line

This is a core program unit with a focus on enhancing leadership and people management capability. It covers diverse traditional and innovative theories, models and tools. It complements traditional views based as PMBoK, applying diverse approaches to contemporary project environments. Many of the unit tasks are framed in uncertain and potentially ambiguous terms as is common in many project environments. Topic areas covered: Project context, Personal Competence, Interpersonal Competence , Team Competence The unit references a range of Australian and global Project Management, Management and Consulting Standards. It integrates theory and practice to optimise results. Recommended reading: A Guide to the Project Management Body of Knowledge (PMBOK Guide)"

PMGT5873
Project Economics and Finance

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: Block mode; Session 2: On-line **Campus:** Camperdown/Darlington **Mode of delivery:** Block Mode

This course equips members of project management teams with information and tools to do financial appraisal and optimise decision making. It imparts basic knowledge and competencies required in project appraisal and financial management applicable to all sectors of industry and business. These include services, business investment, R&D, capital projects, local, state and national government departments and agencies.

Topics include:

- Review of the Fundamentals of Project Economics and Financial Techniques

- Implementation of Fundamental Principles including EUAC, NPV, IRR, B/C, Valuation, Depreciation, Replacement Studies and Life Cycle Costing

- Development of Project Alternatives and Application of the Analysis Techniques

- Sensitivity Analysis, Risk Analysis and Management

- Project Funding and Selection

- Project Appraisal Report.

Textbooks
Grant, Ireson and Leavenworth, Principles of Engineering Economy (J. Wiley & Sons) Latest Edition

PMGT5875
Project Innovation Management

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Late **Classes:** Session 1 and Summer School: Block mode ; Session 2: Online **Campus:** Camperdown/Darlington **Mode of delivery:** On-line

This course is intended for students who want to know what is going on at the leading edges of innovation in project management practice. Important trends in innovation in project organisation, management and delivery are identified and their implications for project innovation management explored. Major topics include: the trend to open information ("open source") rather than protected intellectual property innovation structure; impact of the open innovation structure on organisational project management; improved understanding of the client requirements and achievement of quality goals through open based or user driven project innovation management practices; distribution of innovation over many independent but collaborating actors; and toolkits that empower users to innovate for themselves.

PMGT5876
Strategic Delivery of Change

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: Block Mode; Session 2: Online **Campus:** Camperdown/Darlington **Mode of delivery:** Block Mode

Objectives, Format, and Participants:

This is a modular course designed for on-campus learning among students and industry professionals. We focus on the skills managers need to successfully plan and implement to:

- Change management approaches.

- development and implementation of change management techniques

- development and implementation of change management communications and training

- cultural change management - how does change to culture take place and how can it be managed

- organisational factors and how do they play a role with projects and change management.

Assignments:

Students taking the course will have three sets of assignments:

1. a group presentation which demonstrates capacity to prepare for change management on a large project. This assignment is worth 25% of the overall grade.

2. a group presentation which demonstrates understanding of organisational culture and how change management impacts cultural changes. This assignment is worth 25% of the overall grade.

3. individual assignment describing an insight learnt in the class and how this insight can be applied theoretically and practically. This assignment is worth 50% of the overall grade.

PMGT5877

Management of Project Organisations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: on-line; Session 2: 3 hours per week (evening) **Campus:** Camperdown/Darlington **Mode of delivery:** On-line

This course examines the challenges and approaches of managing project-oriented organisations. These could be independent business units or divisions within a larger corporation. Examples are construction contractors, ICT services, R&D units and many internal business units that are project-oriented.

Today, more organisations are adopting project management as a management strategy to provide effective and timely solutions to clients. They are managing organisational architecture to support both 'business as usual' and projects that are increasingly important to the organisation.

Focus is on the relationship between project management and the following: organisational culture, structure, processes, cross-functional teams, project governance, performance management, organisational learning, change and knowledge management. The assessment comprises a series of case study based assignments, quizzes and exams.

PMGT5879

Strategic Portfolio & Program Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: on-line; Session 2: Block Mode **Campus:** Camperdown/Darlington **Mode of delivery:** Block Mode

This unit specifically addresses the selection and prioritisation of multiple programmes and projects which have been grouped to support an organisation's strategic portfolio.

The allocation of programmes of work within a multi-project environment, governing, controlling and supporting the organisation's strategy, are considered. The aim is to formulate and manage the delivery of the portfolio of strategies using programme management. Students will learn and practice the issues to be considered in selecting an effective organisation portfolio and how to implement a Portfolio Management Framework. Also they will encounter the many conflicting issues facing Program Managers as they seek to implement organisation strategy through programs and learn how to balance these to obtain desired outcomes.

Textbooks

Office of Government Commerce, 2007, Managing Successful Programmes, The Stationery Office, Norwich Pellegrinelli. Sergio, 2008, Thinking and Acting Like a Great Programme Manager, Palgrave Macmillan, Basingstoke

PMGT5886

System Dynamics Modelling for PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: Online; Session 2: 3hrs per week (evenings) **Campus:** Camperdown/Darlington **Mode of delivery:** On-line

Students should achieve an understanding of the roles of statistical methods, coordinate transformations, and mathematical analysis in mapping complex, unpredictable dynamical systems. Systems Thinking is a more natural and better way to think, learn, act, and achieve desired results. Effectively implemented, it can dramatically improve a manager`s effectiveness in today`s complex and interconnected business world. This course provides managers with many practical new Systems Thinking tools and the main concepts of Systems Thinking to enhance individual, team, and organizational learning, change, and performance.

PMGT5887

Computer Applications in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: On-line; Session 2: Block-mode **Campus:** Camperdown/Darlington **Mode of delivery:** Block Mode

Computer-Aided Project Management builds a bridge from the genesis of project management principles through today's software, developing a postmodern project management system paradigm for the twenty-first century. Adopting a unique systems perspective that emphasises project coding--an essential skill in project database management--this course demonstrates what fundamental project management principles are, what they do, and how they work in the software environment. Addressing all phases of a project it illustrates and expands theories through the use of realistic case studies which are based on actual project experience and extensive exercises running on PCs. An important feature of systems project management, the use of "scope" and "quality," is also discussed.

By the end of this unit of study, students should be able to:

- Understand application-based introduction to effective systems and methods for project planning and control

- Understand essential knowledge to manage successfully and to create, use, and communicate PC-, Server-, Web-, and Internet-based project management information.

- Understand the use of structures such as PDS (Project Definition Structure), WBS (Work Breakdown Structure), OBS (Organizational Breakdown Structure), and Masterformat project coding for areas, functions, elements, phases, stages, packages, purchase orders, contracts, and human resources planning and scheduling by CPM (Critical Path Method) and PERT (Program Evaluation and Review Technique) communicating with Gantt and bar charts and graphics such as S curves relating estimating and cost control from order-of-magnitude numbers to appropriation grade budgets.

Textbooks

Kloppenborg.T. Contemporary Project Management (1st Edition) 2009

PMGT5888

Global Project Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: Block Mode; Session 2: Online, available in Summer School **Campus:** Camperdown/Darlington **Mode of delivery:** Block Mode

This course has been designed to suggest the development of best practices in communication, collaboration and management across international borders. The objectives are to: Understand the challenges faced by a global program and project teams; and, Improve the overall skills and practices of global project managers that will lead international companies to achieve maturity in global project management. Topics include: Introduction to traditional, distributed, and virtual project work; Global projects and requirements; Organisational change and organisational theory; Cross-cultural collaboration; Global project leadership; Trust building and conflict resolution; Coaching over distance; Global communication and

channels; Leading a global organisation; Implementing collaborative tools; and, Implementing a Global Project Management Framework.

Textbooks

Binder, Jean (2007). Global PM: Communication, Collaboration and Management across borders. Gower publishing.

PMGT5889

Integrated Cost and Scheduling Control

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: On-line; Session 2: Block Mode **Campus:** Camperdown/Darlington **Mode of delivery:** Block Mode

Aims:

This unit of study focuses on the integrated management of project scope, time and cost for effective control and delivery of projects. The scope of the subject matter includes delivering comprehensive theoretical knowledge and application skills in integrated management and control of cost and schedule in complex projects. By successful completion of this unit of study, students should achieve a clear understanding of the time and cost management and appropriate control measures in project development environments.

Objectives:

Students should be able to:

- Discuss the project management trade-offs on balancing the triple-constraint;

- Explain the integrated cost and schedule control processes;

- Construct work breakdown structure (WBS) using given project information;

- Discuss scope monitoring and change control system;

- Produce networks diagrams for project scheduling;

- Apply critical path analysis (CPA) in network scheduling;

- Apply critical chain method in project scheduling;

- Estimate the project cost and duration;

- Apply resource scheduling techniques;

- Construct a time-phased budget plan;

- Discuss cost monitoring and control processes;

- Undertake earned value analysis (EVA); and

- Undertake integrated cost and schedule control processes using project management software (Microsoft Project or Primavera)

By the end of this unit of study, students should be able to:

- Undertake WBS exercises, CPA, EVA and trade-off analysis using the given project information;

- Explain how the components of time and cost management interrelate;

- Explain in depth why integrated cost and schedule management are important to project management; and

- Analyze a project situation that involves time and cost management issues and apply a solution(s)

Textbooks

Integrated Cost & Scheduling control in Project Management - Ursula Kuehn (Recommended reading, not compulsory)

PMGT5891

Project Risk Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: Block mode; Session 2: Block Mode and On-line **Campus:** Camperdown/Darlington **Mode of delivery:** Block Mode

The aims of this course are to develop students' understanding and ability in applying project risk management skills in project environments. The course enables the students to apply best practice techniques and methods commonly used by industry in project risk management.

The competencies developed through this unit cover and go beyond the competencies in Risk areas as outlined in the competency standards by the Australian Institute of Project Management and Project Management Institute in the USA, respectively. The UoS aims to develop students' ability to understand and conceptualise risk management issues, and analyse and apply risk management techniques using concepts and frameworks from the underpinning literature.

- Ability to establish risk management plans, policies & integrate them with other project plans, organisation & align them to the business case

- Ability tounderstand the sources of potential risks (including but not limited to political, organisational, psychological and technical risks) and to use risk management tools & techniques to identify, assess, evaluate, & prioritise risks

- Ability to simulate the potential effects of risks on schedule, cost and other performance dimensions using sensitivity analysis, decision tree analysis and simulation techniques.

- Ability to track, monitor & control risks & actions to achieve project objectives & the business case

- Ability to close risks for an optimal outcome

PMGT5892

Project Management Industrial Project

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Weekly 3hr meeting, **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Evening

Note: Department permission required for enrolment. Note: Students must have a credit average for admission into this unit.

In this intensive PM capstone project, students are required to apply all of the skills necessary to successfully initiate, plan, execute, control and close a project. Working as part of a team on a simulated four-month, mid-sized, high-priority project, student will be responsible for developing the key project management deliverables, including the project charter, project plan, change control process, status reports and post-project reviews. Students will facilitate meetings, update the project plan with actuals and changes, present status to management, justify your decisions to key stakeholders and determine the impacts of your actions on multiple projects. Under the guidance of a senior project manager and their academic supervisor, students will be given direct feedback and techniques to increase efficiency and effectiveness.

Alternatively students with a 75D average may have the opportunity with permission to do an Honours level thesis working on a full-time project. The Hons level thesis will be a minimum of 70 pages and max of 100 pages. Please contact the Coordinator to discuss.

PMGT5893

Statistical Methods in PM

Credit points: 6 **Session:** Semester 2 **Classes:** 3hrs Weekly (evening) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Evening

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

Objectives:

- Conduct hypothesis test and draw conclusions;

- Apply regression analysis to examine relationships between variables;

- Explain the relationships between variables;

- Describe the distributions of variables;

- Draw conclusions based on results observed in a sample;

- Discuss the application of statistical model for project selection;

- Apply statistical method for forecasting project time and cost at completion;

- Discuss the application of statistical model for cost estimating; and

- Apply SPSS in analyzing and evaluating a project situation.

By the end of this unit of study, students should be able to:

- Discuss the applications of statistical methods in project management;

- Evaluate a project situation based on statistical results; and

- Apply simple statistical methods to problem-solving in project management.

PMGT5895
Contracts Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: Weekly ; Session 2: Weekly **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The aim of this unit is the understanding of fundamental contracts as it relates to project management. The aim is that students are able to understand various contracts that are available and have the ability to select the right contract for a project. The unit aims to give an understanding of contract terms and conditions that may give rise to potential issues and methods to mitigate this. Given contracts are pivotal in a project manager's role the overall aim is for students to understand contracts better and have the confidence to use contracts in their day to day activities to avoid potential risks and conflicts. In addition it will assist students to have the ability to solve complex issues by being able to think critically and analyze issues.

Outcomes:

Understanding the basis of contract management-including traditional and contemporary theories;

Being able to identify contract terms that expose the project manager to risk;

Gain confidence to be able to raise contract issues and negotiate terms.

PMGT5896
Sustainability & Intelligence in P. M.

Credit points: 6 **Session:** Semester 2 **Classes:** 3hr per week evening classes **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

In order to run projects successfully, project managers need to master more than the requisite technical knowledge. The more complex the project, the more significant interpersonal skills become to achieving a successful outcome. Without the people skills necessary to lead effectively, even the most carefully orchestrated project can quickly fall apart. This unit aims to introduce project managers to the basic concepts of emotional intelligence and shows how to apply them to their project goals. Students will learn how to: Set the tone & direction for the project, communicate more effectively, improve listening skills, create a positive work environment, motivate, coach and mentor team members and productively handle stress, criticism and blame.

PMGT5897
Disaster Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** 3hr per week in one session; evening class. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit identifies the causes of some well-known project failures and reveals what can be learned by being able to think critically and analyse the issues. The aim of this unit is to outline traditional and contemporary theories in emergency response planning; to provide an overall scope of comprehensive emergency planning and the major elements that must be addressed in an Emergency Response Plan. Student outcomes from this unit include: Developing & implementing an Emergency Response Plan; Specific recommendations for the health & safety of emergency response personnel and provides concise information on learning objectives and a review of important concepts.

PMGT5898
Complex Project Leadership

Credit points: 6 **Session:** Semester 2 **Classes:** 3hrs per week in one session; evening classes **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit will offer students an innovative way of looking at projects and treating them as complex adaptive systems. Applying the principles of complexity thinking will enable project managers and leadership teams to manage large-scale initiatives successfully. The expected outcomes of this unit include: Exploring how complexity thinking can be used to find new, creative ways to think about and manage projects; Diagnose complexity on a wide range of projects; Understand and manage the complexity of the business problem and use the Project Complexity Model to determine the most effective approach to managing all aspects of a project based on the level of complexity involved.

PMGT5900
Project Management Thesis

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Session 1 & 2: Thesis project **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This UoS aims to give students a rich experience in carrying out a major project within an industrial environment, which will have significant ties to their chosen specialisation. Supervision of the project will be joint between the University and Industry. Students will work in industry for 12 weeks and engage fulltime on the project at the industrial site. Students will prepare and present a detailed technical report on their work

This UoS will give students essential experience working on real-life projects, where their knowledge gained in their MPM will be put into practice. Students will also obtain invaluable knowledge and experience of the way engineering skills are employed in an industrial context.

Students will have the ability to write a thorough technical report and present it in a professional manner.

PMGT6867
Quantitative Methods: Project Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1: 3 hours per week (evening); Session 2: Online **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Evening

This unit has been designed to teach understanding of the principles to plan, manage and deliver project scope, time and cost.

- To develop underpinning knowledge of scope, time and cost management as applied to projects

- To provide practical examples and opportunities to apply the relevant section of PMBOK to understanding the management of scope, time and cost on projects

- To initiate process of reflective learning and evidence development for competencies in the areas of scope, time and cost management.

Topics include:

- Project Integration
- Project Scope Management
- Project Time Management
- Project Cost Management
- Project Quality Management
- Project Risk Management

Textbooks

The Handbook of Project-based Management - Rodney J. Turner, McGraw Hill 1999, 3rd Edition or later
PMBOK 2000 - A Guide to the Project Management Body of Knowledge, Project Management Institute, 2000
Project Management The Managerial Process - Clifford F. Gray & Erik W. Larson, International Edition 2000

PMGT6869
Advanced Knowledge in Project Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Session 1 : On-line, Session 2 : Block mode. **Assumed knowledge:** PMBoK Guide **Campus:** Camperdown/Darlington **Mode of delivery:** Block Mode

The objectives of this Unit are:

Develop capability in creating environments for the success of multiple, large and complex projects

View problems as systems composed of interacting, interrelated, and interdependent components

Solve complex real-world problems

Examples of Unit outcomes include an ability to lead stakeholders in situations of changing needs and requirements in a `managed' way, understanding that typical solutions to current problems may be the foundations for future failures & being able to deal with the unique challenges of large and complex projects.

Topics include:

- Business Case Development
- Project Failure
- Large and Multiple Projects
- International Project Teams
- Organisational Learning
- Corporate Law
- Systems Practice
- Organisational Design
- Performance and Benefit Measurement
- Project Management Methodology (PRINCE2)
- Systems and Data Integration
- Project Managing Events

School of Electrical and Information Engineering

ELEC5101
Antennas and Propagation

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and a 3 hours laboratory each week. **Prohibitions:** ELEC5522 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The first part of the unit describes the theory of radiation from elementary current sources, wires and arrays and introduces antenna terminology and characteristics such as radiation patterns, directivity, polarization and gain. The properties of receiving and transmitting antennas in a communications link are also described.

The second part of the unit describes three significant areas in antenna practice. (1) Numerical analysis of wire antennas; an introduction to the computer aided design of wire antennas and arrays. (2) Aperture antennas; an introduction to horn and reflector antennas and their applications. (3) Microstrip antennas; an introduction to modern printed circuit antennas and arrays and their applications.

The third part of the unit describes signal processing for multi-antenna arrays. Topics include Space-time coding, Multi-input Multi-output (MIMO) capacity, MIMO transmission, and the effects of antenna correlation.

ELEC5203
Topics in Power Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hour tutorial/loboratory per week. **Assumed knowledge:** (ELEC3201 Electrical Energy Systems or ELEC3203 Power Engineering) and (ELEC3202 Power Electronics and Drives or ELEC3204 Power Electronics and Drives). **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to give students an in depth understanding of modern power electronic equipment supporting the intelligent grid of the future and the associated electronic control. Electronic power systems rely on a complex system of methods and equipment for controlling the voltage levels and for maintaining the stability and security of the supply. It covers recent findings in the fundamental theory and the massive change of modern power electronic equipment and methods supporting the electricity grids. It also looks at the huge influence of computer-aided analysis of electric power systems and the effects of the deregulation of the industry. The specific topics covered are as follows: Introduction to power electronic systems and applications in the electrical grid, power semiconductors, reactive power control in power systems, flexible AC transmission systems (FACTS), high-voltage direct-current transmission (HVDC), static reactive power compensator, dynamic voltage restorer, unified-power flow controller, line-commutated converters, thyristor-controlled equipment, phase-angle regulators, voltage-source converter based power electronic equipment, harmonics, power quality, passive and active filters, distributed generation, grid-interconnection of renewable energy sources, intelligent grid technologies.

ELEC5204
Power Systems Analysis and Protection

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 1 hour tutorial per week, 2 hours laboratory per week. **Prohibitions:** ELEC4201 **Assumed knowledge:** The unit assumes basic knowledge of circuits, familiarity with basic mathematics, competence with basic circuit theory and an understanding of three phase systems, transformers, transmission lines and associated modeling and operation of such equipment. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit provides the basis for the analysis of electricity grids using symmetrical components theory. It assumes familiarity with basic mathematics, competence with basic circuit theory and an understanding of three phase systems, transformers, transmission lines, etc.

The following specific topics are covered: The types and causes of power system faults; balanced faults and short circuit levels; an introduction to fault current transients in machines; symmetric components, sequence impedances and networks; the analysis of unsymmetrical faults. Review of the impact of faults on power system behaviour; issues affecting protection scheme characteristics and clearance times; the security and reliability of protection schemes; the need for protection redundancy and its implementation as local or remote backup; zones of protection and the need for zones to overlap; the analysis and application of over-current and distance relay protection schemes with particular reference to the protection of transmission lines.

ELEC5205
High Voltage Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours lecture and 3 hours tutorial/lab per week. **Assumed knowledge:** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals equivalent to ELEC3105 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Recommended: ELEC5204 Power Systems

The unit provides advanced knowledge associated with high voltage engineering methods, techniques and equipment. It is divided into two sections. The first section presents fundamentals of the failure mechanisms of solid, liquid and gaseous insulation at high voltages. It also discusses consequent design principles for high-voltage equipment; of the generation of high direct, alternating and impulse voltages for testing high-voltage equipment; and of methods for monitoring and assessing the condition of high-voltage equipment such as dissolved gas analysis for oil-filled transformers and partial discharge in cables. The second section presents in detail all the high-voltage equipment and in particular underground cables, overhead transmission lines, transformers, bushings and switchgear. It finally offers asset management solutions for modern transmission and distribution electricity networks.

ELEC5206
Sustainable Energy Systems

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures per week and 2 hours of labs and 2 hours of tutorials per fortnight. **Assumed knowledge:** Following concepts are assumed knowledge for this unit of study: familiarity with transformers, ac power, capacitors and inductors, electric circuits such as three-phase circuits and circuits with switches, and basic electronic circuit theory. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit builds upon the knowledge of engineering mathematics, electronic devices and circuit theory and simulation techniques. It deals with both technical and business aspects of sustainable electrical energy systems. In technical aspect, it focuses on energy conversion and electrical characteristics of different renewable energy sources and integration of multiple energy sources into distributed electricity generation. In business aspect, it focuses on economical, marketing

and political aspects of installing and managing sustainable electrical energy systems in present and future society. It lays a solid foundation of practical and managerial skills on electronics and electrical (power) engineering and later studies such as ELEC5203 and advanced energy conversion and power systems. The following topics are covered: modern power systems; distributed generation; co-generation; tri-generation; microturbine; renewable energy sources: solar, wind, hydro, biomass, geothermal, fuel cells; wind turbine; photovoltaic; grid-connected power systems; stand-alone power systems; power conditioner; maximum power point tracking; single-axis and two-axis tracker.

ELEC5303
Computer Control System Design

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours lab/tutorial per week. **Prohibitions:** ELEC4301 **Assumed knowledge:** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to teach the basic issues involved in the analysis and design of computer-controlled systems. The emphasis is on theory rather than technological application or industrial practice.

However, students are expected to test some of these ideas on a few benchmark control problems in the laboratory. Completion of the unit will facilitate progression to advanced study in the area and to work in industrial control. This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory.

The following topics are covered. Sampled data systems: aliasing. Zero order hold equivalent: inverse of sampling, sampling system with time delay. Properties of difference equations: solution, stability, change of co-ordinates, Z transform. Input output models: pulse response, pulse transfer operator, pulse transfer function, interpretation of poles and zeros.

Analysis of discrete time system: stability (Jury's test, Nyquist criterion, Lyapunov method), sensitivity and robustness, observability (observers, reduced order observers), reachability and controllers, loss of reachability/observability through sampling, output feedback, the Separation theorem. Optimal control: Kalman filter, linear quadratic regulator, output feedback, the Separation theorem.

Approximating continuous time controllers. Finite word length mplementations.

ELEC5402
Digital Integrated Circuit Design

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours project work in class per week. **Prohibitions:** ELEC4402 **Assumed knowledge:** Electronic circuit design and physics of electronic devices. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study explores CMOS technology and integrated circuit design and fabrication. The fundamental theory and techniques behind digital integrated circuit design are introduced. A primary focus of this unit is providing the student with practical laboratory design experience using a professional VLSI CAD tool to design digital integrated circuits. This unit provides a foundation for more advanced digital integrated circuit design techniques and also analogue integrated circuit design.

Topics covered in this unit are: IC manufacturing process and CMOS technology, CMOS static logic design, CMOS dynamic logic design, arithmetic building block design, sequential logic design, VLSI interconnection and wiring issues, timing issues, digital memory design, digital system design methodologies.

ELEC5403
Radio Frequency Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours lab/tutorial per week. **Prohibitions:** ELEC5521 **Assumed knowledge:** Students will be expected to be familiar with ELEC3404 - Electronic Circuit Design , ELEC3104 - Engineering Electromagnetics and the third year course in Circuit Design: ELEC3105 - Circuit Theory and Design. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study builds upon earlier work and provides an introduction to radio frequency components and systems used in wireless and satellite communications as well as in other high frequency applications. It assumes some knowledge of: basic circuit analysis; semiconductor device models and behaviour; transistor operation as switches and amplifiers; transistor operation as current sources and current mirrors; differential amplifiers.

The following topics are covered: RF circuit element models, high-frequency effects and biasing in active devices, transmission lines and the Smith Chart, RF system characteristics, RF amplifiers, oscillators, mixers, power amplifiers, microwave measurements.

ELEC5507
Error Control Coding

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 1 hour tutorial per week. **Prohibitions:** ELEC4503 **Assumed knowledge:** Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit deals with the principles of error control coding techniques and their applications in various communication and data storage systems. Its aim is to present the fundamentals of error control coding techniques and develop theoretical and practical skills in the design of error control encoders/decoders. Successful completion of this unit will facilitate progression to advanced study or to work in the fields of telecommunications and computer engineering. It is assumed that the students have some background in communications principles and probability theory.

The following topics are covered. Introduction to error control coding, linear algebra. Linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, burst-error correcting codes, design of codecs for block codes, applications of block codes in communications and digital recording. Convolutional codes, Viterbi algorithm, design of codecs for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codecs for trellis codes, applications of trellis codes in data transmission. Turbo codes and applications to space and mobile communications.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and a 1 hour tutorial per week. **Prohibitions:** ELEC5504, ELEC4504 **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit will introduce the key ideas in modern wireless telecommunications networks. It will address both physical layer issues such as propagation and modulation, plus network layer issues such as capacity, radio resource management and mobility management issues.

The following topics are covered. Mobile radio channel: Multipath fading, diversity, log-normal fading, mean propagation loss, propagation models. Cellular technologies: Cell types, coverage, frequency reuse, spectral efficiency, link budget, power budget, traffic capacity. Omnidirectional and sectorised antennas. Handover, interaction with the fixed network. Microcells and macrocells, Medium access control: Near-far effect and the hidden terminal problem. Multiple access schemes: FDMA, TDMA, CDMA. Aloha and s-Aloha, carrier sense multiple access, reservation-based MAC schemes, polling, spread-aloha multiple access. GSM: System architecture, radio resource management, mobility management, connection management.

Third generation systems: WCDMA and cdma2000. Wireless LANs: IEEE802.11, Hiperlan, Bluetooth. Convergence: GSM evolution to data services via GPRS and EDGE. Issues with TCP over wireless. Mobility management in MobileIP.

ELEC5509
Mobile Networks

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lecture and a 2 hours tutorial/project meeting per week. **Prohibitions:** ELEC5501 **Assumed knowledge:** 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. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study serves as an introduction to communications network research. The unit relies on a solid understanding of data communications and mobile networks. It introduces some of the currently most debated research topics in mobile networking and presents an overview of different technical solutions. Students are expected to critically evaluate these solutions in their context and produce an objective analysis of the advantages/disadvantages of the different research proposals. The general areas covered are wireless Internet, mobility management, quality of service in mobile and IP networks, ad hoc networks, and cellular network architectures. The following topics are covered. Introduction to wireless and mobile Internet. Wireless cellular data networks. Cellular mobile networks. Mobile networks of the future. Quality of service in a mobile environment. Traffic modelling for wireless Internet. Traffic management for wireless Internet. Mobility management in mobile networks. Transport protocols for mobile networks. Internet protocols for mobile networks.

ELEC5510
Satellite Communication Systems

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures,1 hour tutorial per week. 3 hour site visit during semester. **Prohibitions:** ELEC5502 **Assumed knowledge:** Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3505 Communications and ELEC4505 Digital Communication Systems, is assumed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Satellite communication systems provide fixed and mobile communication services over very large areas of land, sea and air. This unit presents the fundamental knowledge and skills in the analysis and design of such systems. It introduces students to the broad spectrum of satellite communications and its position in the entire telecommunications network; helps students to develop awareness of the key factors affecting a good satellite communications system and theoretical and practical skills in the design of a satellite communications link.

Topic areas include: satellite communication link design; propagation effects and their impact on satellite performance; satellite antennas; digital modem design, speech codec design; error control for digital satellite links.

ELEC5511
Optical Communication Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours laboratory/tutorial per week. **Assumed knowledge:** (ELEC3503 Introduction to Digital Communications or ELEC3505 Communications) and (ELEC3402 Communications Electronics or ELEC3405 Communications Electronics and Photonics) or equivalent **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This course will provide an understanding of the fundamental principles of optical fibre communication systems. It commences with a description of optical fibre propagation characteristics and transmission properties. We will then consider light sources and the fundamental principles of laser action in semiconductor and other lasers, and also the characteristics of optical transmitters based on semiconductor and electro-optic modulation techniques. The characteristics of optical amplifiers will also be discussed. On the receiver side, the principles of photodetection and optical receiver sensitivity will be discussed. Other aspects such as fibre devices and multiple wavelength division multiplexing techniques will also be discussed. Finally, the complete optical fibre communication system will be studied to enable the design of data transmission optical systems, local area networks and multi-channel optical systems.

ELEC5512
Optical Networks

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 1 hour laboratory/tutorial per week. **Prohibitions:** ELEC5506 **Assumed knowledge:** ELEC3503 Introduction to Digital Communications **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics) and ELEC5511 (Fibre Optic Communication Systems). It focuses on photonic network architectures and protocols, network design, enabling technologies and the drivers for intelligent optical network. Students will learn how to analyze and design optical networks and optical components. Introduction, photonic network architectures: point to point, star, ring, mesh; system principles: modulation formats, link budgets, optical signal to noise ratio, dispersion, error rates, optical gain and regeneration; wavelength division multiplexed networks; WDM components: optical filters, gratings, multiplexers, demultiplexers, wavelength routers, optical crossconnects, wavelength converters, WDM transmitters and receivers; Wavelength switched/routed networks, ultra high speed TDM, dispersion managed links, soliton systems; broadcast and distribution networks, multiple access, subcarrier multiplexed lightwave video networks, optical local area and metropolitan area networks; protocols for photonic networks: IP, Gbit Ethernet, SDH/SONET, FDDI, ATM, Fibre Channel.

ELEC5514
Networked Embedded Systems

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours lecture and 2 hours lab per week. **Assumed knowledge:** ELEC3607, ELEC3305, ELEC3506 and ELEC5508 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aim to teach the fundamentals concepts associated with: embedded systems programming, real-time operating systems wireless channel propagation and radio power consumption power-aware and energy-aware communication protocols. Distributed embedded systems problems such as time synchronization and node localization, Programming of networked embedded systems Exposure to several recently developed solutions to address problems in wireless sensor networks and ubiquitous computing giving them a well-rounded view of the state-of the-art in the networked embedded systems field. Student involvement with projects will expose them to the usage of simulators and/or programming some types of networked embedded systems platforms. Ability to identify the main issues and trade-offs in networked embedded systems. Understanding of the state-of-the-art solutions in the area Based on the above understanding, ability to analyse requirements and devise first-order solutions for particular networked embedded systems problems. Familiarization with a simulator platform and real hardware platforms for network embedded systems through the students involvement in projects.

ELEC5515
Gigabits Wireless Systems

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week **Assumed knowledge:** This unit assumes a competence in fundamental communications theory on modulation and equalization, digital signal processing techniques on filtering and FFT/IFFT, error-control coding and linear algebra. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study aims to provide the theory and design aspects of high speed and short-range wireless systems operating in the unlicensed frequency bands. The targeted system is at multi-gigabits per second within a 100m operating space. Typical applications include wireless local (or personal) area networks. At the completion of this unit, students will gain the essential knowledge to design a gigabit wireless system based any of the emerging standards. The following specific topics are covered: international regulatory requirements on unlicensed frequency bands; the MAC and PHY overview of WirelessHD, ECMA and IEEE802.11/15 standards; an introduction

of the industry design process and tools. 60 GHz transceiver architecture and high-speed ADC/DAC requirements; pre-amble and pilot signal design; initial acquisition techniques; OFDM techniques (automatic gain control (AGC); channel estimation; carrier and sampling frequency estimation and compensation; in-phase and quadrature (I/Q) imbalance characterization, estimation and compensation; soft-output algorithms; peak to average power ratio (PAPR) reduction and adaptive bit loading); beam-forming and multiple input and multiple output(MIMO) techniques; Case study: solutions for IEEE802.11 VHT

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures, 1 hour tutorial per week, 2 hours labs per week. **Prohibitions:** ELEC4602 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems). Ability to program in a high level language. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit is concerned with the theory and practice of real time computer systems as applied to the design of embedded systems and computer control systems in engineering, manufacturing and automation.

Some background in programming, object oriented design and system architecture is assumed. A prime aim of this unit of study is to develop a capacity for research and inquiry in the field of real-time and embedded systems. Completion of this unit will facilitate progression to advanced study or to work in embedded systems and industrial real-time computer systems.

The following topics are covered. Hard real time and embedded systems, as applied to engineering, manufacturing and automation. Timing and scheduling: periodic vs aperiodic processes, deadlines, rate monotonic, deadline monotonic and earliest deadline scheduling. Management of shared resources. Real-time languages and their features. Real time operating systems. Real time software design. Embedded Systems: overview, signal flow, interfacing. Reliability and fault tolerance in hardware and software. SCADA and DCCS. Some case studies.

ELEC5616
Computer and Network Security

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures, 1 hour of tutorial and 2 hours labs per week. **Prohibitions:** ELEC5611, NETS3016, NETS3916 **Assumed knowledge:** A programming language, basic maths. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit examines the basic cryptographic building blocks of security, working through to their applications in authentication, key exchange, secret and public key encryption, digital signatures, protocols and systems. It then considers these applications in the real world, including models for integrity, authentication, electronic cash, viruses, firewalls, electronic voting, risk assessment, secure web browsers and electronic warfare. Practical cryptosystems are analysed with regard to the assumptions with which they were designed, their limitations, failure modes and ultimately why most end up broken.

ELEC5618
Software Quality Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours lecture and 2 hours tutorials per week. **Prohibitions:** SOFT3302 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit will cover software quality planning, validation and verification methods and techniques, risk analysis, software review techniques, software standards and software process improvement and software reliability. The unit covers testing and quality assurance from a unit testing/developer-based focus up to an overall quality process overview of the software development life cycle. Students who successfully complete this unit will: understand the fundamental concepts of software quality, be able to assess the quality of a software design, be acquainted with methods of building for quality and be able to verify and test a unit of code through familiarity with unit testing strategies and understanding software quality assurance as a rigorous and structured formal process.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours project work in class per week. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit aims to introduce students to the main issues involved in producing large Internet systems by using and building application frameworks. Frameworks allow great reuse so developers do not have to design and implement applications from scratch, as students have done in ELEC3610 The unit lays down the basic concepts and hands on experience on the design and development of enterprise systems, emphasizing the development of systems using design patterns and application frameworks. A project-based approach will introduce the problems often found when building such systems, and will require students to take control of their learning. A project-based approach will introduce the problems often found when building such systems, and will require students to take control of their learning. Several development Java frameworks will be used, including Spring, Hibernate, and others. Principles of design patterns will also be studied.

ELEC5620
Model Based Software Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours lectures, 1 hour of tutorial and 2 hours of lab/project work in class per week. **Assumed knowledge:** A programming language, basic maths **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Model-Based Software Engineering focuses on modern software engineering methods, technologies, and processes used in professional development projects. It covers both the pragmatic engineering elements and the underlying theory of the model-based approach to the analysis, design, implementation, and maintenance of complex software-intensive systems. Students will participate in a group project, which will entail developing and/or evolving a software system, following a full development cycle from requirements specification through to implementation and testing using up-to-date industrial development tools and processes. At the end of the course they will provide a presentation and demonstration of their project work to the class. There is no formal teaching of a programming language in this unit, although students will be expected to demonstrate through their project work their general software engineering and architectural skills as well as their mastery of model-based methods and technologies. Students successfully completing this unit will have a strong practical and theoretical understanding of the modern software development cycle as applied in industrial settings. In particular, they will be familiar with the latest model-based software engineering approaches necessary for successfully dealing with today's highly complex and challenging software systems. The pedagogic grounds for this course and its focus on model-based approaches are to arm new software engineers with skills and perspectives that extend beyond the level of basic programming. Such skills are essential to success in software development nowadays, and are in great demand but very low supply. The dearth of such expertise is one of the key reasons behind the alarmingly high failure rate of industrial software projects (currently estimated at being greater than 40%). Therefore, this unit complements SQE and strengthens a key area in the program.

ELEC5701
Technology Venture Creation

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 1 hour visiting professional or team-based interaction exercise per week. **Prohibitions:** ENGG4003 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study prepares graduating students with insight and skills in how to turn a concept into a high technology startup company. The

class will provide students with knowledge, practical experience and frameworks to assist in evaluating the market for a technology product or service, the design & viability of business models around it, the formulation of a funding-reading business plan & financials, capital raising options & process, venture capital, building distribution channels, intellectual property protection, putting together an A-grade management team, term sheets & funding documentation, technology sales models and going global. We will look at real world case studies of successful technology companies (and flame outs). Does Twitter have a viable business model? Will Facebook eat its lunch? Is YouTube just burning cash? Will Google rule the world? During the period of the course, students will form teams and write a business plan around a concept they propose. Each student will assume a role in the team (CEO, CTO, CFO, VP Sales & Marketing). The plan will be judged by a panel of real world venture capitalists, entrepreneurs and angel investors to determine the final grade for the course. The course is limited to 40 students (10 teams of 4) in addition to a waiting list of 8. Be warned that a serious commitment will be required in developing the concept into a viable business plan. The outcome, however, will be very rewarding to those students interested in starting the next Google. Prospective students should send an email in 400 words or less on why they want to enroll prior to acceptance, to the course email address. This course is taught by instructors experienced in technology startups & venture capital. The course will include a number of guest lectures by industry.

ELEC5720

Foundations Electronic Devs and Circuits

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures per week, and a 2 hours tutorial and 2 hours lab per fortnight. **Prohibitions:** ELEC2104, ELEC2401 **Assumed knowledge:** Ohm's Law and Kirchoff's Laws; action of Current and Voltage sources; network analysis and the superposition theorem; Thevenin and Norton equivalent circuits; inductors and capacitors, transient response of RL, RC and RLC circuits; the ability to use power supplies, oscilloscopes, function generators, meters, etc. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students who do not have an Engineering degree.

Modern Electronics has come to be known as microelectronics which refers to the Integrated Circuits (ICs) containing millions of discrete devices. This course introduces some of the basic electronic devices like diodes and different types of transistors. It also aims to introduce students the analysis and design techniques of circuits involving these discrete devices as well as the integrated circuits. Completion of this course is essential to specialize in Electrical, Telecommunication or Computer Engineering stream. The knowledge of ELEC1103 is assumed.

ELEC5721

Foundations of Signals and Systems

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures, 2 hours lab/tutorial per week and 1 hour of eLearning session per week. **Prohibitions:** ELEC2301, ELEC2302, MATH3019, MATH3919 **Assumed knowledge:** MATH1001 Differential Calculus and MATH1002 Linear Algebra and MATH1003 Integral Calculus and Modelling. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only avaliable to Master of Professional Engineering students who do not have an Engineering degree.

This unit aims to teach some of the basic properties of many engineering signals and systems and the necessary mathematical tools that aid in this process. The particular emphasis is on the time and frequency domain modeling of linear time invariant systems. The concepts learnt in this unit will be heavily used in many units of study (in later years) in the areas of communication, control, power systems and signal processing. A basic knowledge of differentiation and integration, differential equations, and linear algebra is assumed.

ELEC5723

Found: Simulations & Numerical Solutions

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hours per week, Laboratory 3 hours per week. **Prohibitions:** ELEC2103 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Objectives: How to apply the software package Matlab to achieve engineering solutions Critical assessment of various computer numerical techniques Professional project management, teamwork, ethics This unit assumes an understanding of the fundamental concepts and building blocks of electrical and electronics circuits. As well as covering the specific topics described in the following paragraphs, it aims to develop skills in professional project management and teamwork and promote an understanding of ethics. Basic features of Matlab. The Matlab desktop. Interactive use with the command window. Performing arithmetic, using complex numbers and mathematical functions. Writing script and function m-files. Matrix manipulations. Control flow. Two dimensional graphics. Application of Matlab to simple problems from circuit theory, electronics, signals and systems and control. Investigation of the steady state and transient behaviour of LCR circuits. Matlab based numerical solutions applicable to numerical optimization, ordinary differential equations, and data fitting. Introduction to symbolic mathematics in Matlab. Applications, including the derivation of network functions for simple problems in circuit analysis. Introduction to the use of Simulink for system modelling and simulation.

ELEC5730

Foundations of Eng Electromagnetics

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours tutorial per week. **Prohibitions:** ELEC3102, ELEC3104 **Assumed knowledge:** Differential calculus, integral calculus, vector integral calculus; electrical circuit theory and analysis using lumped elements; fundamental electromagnetic laws and their use in the calculation of static fields. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering students with a Non-Electrical Engineering degree.

This unit introduces students to the broad spectrum of engineering electromagnetics and helps students to develop theoretical and analytical skills in the area of electrical and telecommunications engineering and develop understanding of the basic electromagnetic theory underpinning optical communications, wireless communications and electrical engineering.

ELEC5732

Foundations of Electricity Networks

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours lab/tutorial per week. **Prohibitions:** ELEC3201, ELEC3203 **Assumed knowledge:** This unit of study assumes a competence in first year mathematics (in particular, the ability to work with complex numbers), in elementary circuit theory and in basic electromagnetics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

This unit of study provides an introduction to electrical power engineering and lays the groundwork for more specialised units. It assumes a competence in first year mathematics (in particular, the ability to work with complex numbers), in elementary circuit theory and in elements of introductory physics.

A revision will be carried out of the use of phasors in steady state ac circuit analysis and of power factor and complex power.

The unit comprises an overview of modern electric power system with particular emphasis on generation and transmission.

Detailed study will be carried out of the following. The use of three phase systems and their analysis under balanced conditions. Transmission lines: calculation of parameters, modelling, analysis. Transformers: construction, equivalent circuits. Generators: construction, modelling for steady state operation. The use of per unit systems. The analysis of systems with a number of voltage levels. The control of active and reactive power. The load flow problem: bus and impedance matrices, solution methods.

ELEC5733

Foundations of Power Electronics & Apps

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures, 3 hours lab/tutorial per week. **Prohibitions:** ELEC3202, ELEC3204 **Assumed knowledge:** Differential equations, linear algebra, complex variables, analysis of linear circuits. Fourier theory applied to periodic and non-periodic signals.

Software such as MATLAB to perform signal analysis and filter design. Familiarity with the use of basic laboratory equipment such as oscilloscope, function generator, power supply, etc. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

This unit of study aims to teach the fundamentals of advanced energy conversion systems based on power electronics. It provides description of the operation principles and control of these blocks. Through analysis and design methodologies, it delivers an in depth understanding of modern enabling technologies associated with energy conversion. Through laboratory hands-on experience on actual industrial systems, such electrical motor drives, robotic arms, and power supplies, it enhances the link between the theory and the "real" engineering world. The unit clarifies unambiguously the role these imperative technologies play in every human activity; from mobile telephone chargers to energy electricity grids; from electric vehicles and industrial automation to wind energy conversion to name just few. The following topics are covered: Introduction to power electronic converters and systems; applications of power electronic converters; power semiconductor devices; uncontrolled rectifiers: single- and three-phase; non-isolated dc-dc converters: buck, boost and buck-boost; isolated dc-dc converters; inverters: single- and three-phase; uninterruptible power supplies; battery chargers and renewable energy systems; electric and hybrid electric vehicles technologies, design of converters and systems.

ELEC5734

Foundations Elec Energy & Conversion Sys

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures per week and 3 hours of labs and one hour of tutorial per fortnight. **Assumed knowledge:** Following concepts are assumed knowledge for this unit of study: familiarity with circuit theory, electronic devices, ac power, capacitors and inductors, and electric circuits such as three-phase circuits and circuits with switches, the use of basic laboratory equipment such as oscilloscope and power supply. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

This unit of study aims to give students a good understanding of electrical energy conversion techniques and equipment. Students who successfully complete this unit will have a broad view of electrical energy conversion systems including transformers, DC machines, induction machines and synchronous machines; be able to analyze and solve problems in transformers and electric machines; have gained confidence in their ability to undertake more advanced study in the power area. The following specific topics are covered: magnetic circuits, inductance, sinusoidal excitation, hysteresis and eddy current loss, permanent magnets, electromechanical energy conversion, singly-excited and doubly-excited systems, transformers, single-phase, equivalent circuit parameters, three-phase transformers, autotransformers, DC machines, separate excitation, shunt excitation, series excitation, and compound excitation, efficiency, armature reaction, induction machines, revolving field, equivalent circuit, squirrel cage machines, measurements of the parameters, DC resistance test, no-load test, blocked-rotor test, synchronous machines, field relationships, power-angle relationships, salient pole machines.

ELEC5735

Foundations of Control

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and a 3 hours lab/tutorial per week. **Prohibitions:** ELEC3302, ELEC3304, AMME3500 **Assumed knowledge:** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform. ELEC2302 and MATH2061 or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

This unit is concerned with the application of feedback control to continuous-time, linear time-invariant systems. The emphasis is on fundamental theory rather than applications. Some background in linear systems theory and the Laplace transform is assumed. The prime aim of this unit of study is to develop a sound understanding of basics and a capacity for research and inquiry. Completion of the unit will facilitate progression to advanced study in the area and to work in industrial control.

The following topics are covered. History of control. Modelling of physical processes; state variables and differential equations. Dynamic response; review of Laplace transform, transfer functions and block diagrams, poles and zeroes. Design specifications in the time domain. Basic feedback principles; effect of feedback on sensitivity and disturbance rejection, steady state accuracy and stability; the Routh criterion; proportional, integral and derivative control. Design using the root locus; rules for sketching root locus; lead and lag compensators; analogue and digital implementation of controllers. Frequency response; the Nyquist stability criterion; gain and phase margins; compensator design in the frequency domain. An introduction to state space design for single input single-output systems; eigenvalues, zeroes and transfer functions; state variable feedback and design of estimators.

ELEC5736

Foundations of Digital Signal Processing

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours lab/tutorial per week. **Prohibitions:** ELEC3303, ELEC3305 **Assumed knowledge:** Specifically the following concepts are assumed knowledge for this unit: familiarity with basic Algebra, Differential and Integral Calculus, continuous linear time-invariant systems and their time and frequency domain representations, Fourier transform, sampling of continuous time signals **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

This unit aims to teach how signals are processed by computers. It describes the key concepts of digital signal processing, including details of various transforms and filter design. Students are expected to implement and test some of these ideas on a digital signal processor (DSP). Completion of the unit will facilitate progression to advanced study in the area and to work in the industrial use of DSP. This unit assumes a basic knowledge of differentiation and integration, differential & difference equations and linear algebra, plus various time and frequency domain representations of continuous time signals and systems.

The following topics are covered. Review of analog and digital signals. Analog to digital and digital to analog conversion. Some useful digital signals. Difference equations and filtering. Impulse and step response of filters. Convolution representation of filters. The Z-transform. Transfer functions and stability. Discrete time Fourier transform (DTFT) and frequency response of filters. Finite impulse response (FIR) filter design: windowing method. Infinite impulse response (IIR) filter design: Butterworth filters, Chebyshev filters, Elliptic filters and impulse invariant design. Discrete Fourier Transform (DFT): windowing effects. Fast Fourier Transform (FFT): decimation in time algorithm. DSP hardware.

ELEC5737

Foundations of Electronic Circuit Design

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures per week, 2 hours tutorial and 3 hours laboratory per fortnight. **Prohibitions:** ELEC3401, ELEC3404 **Assumed knowledge:** A background in basic electronics and circuit theory is assumed. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

This unit of study aims to teach students analysis and design techniques for electronic systems such as signal amplifiers, differential amplifiers and power amplifiers. A background in basic electronics and circuit theory is assumed. Completion of this unit will allow progression to advanced studies or to work in electronics and telecommunication engineering.

Topics covered are as follows. The BJT as an amplifier. Biasing in BJT amplifier circuits. Small signal operation and models. Single stage BJT amplifiers. BJT internal capacitances and high frequency models. The frequency response of the common-emitter amplifier. BJT current sources and current mirrors. Differential amplifiers. Output stages and power amplifiers:class A, class B and class AB.

ELEC5738
Foundations Comm Electronics & Photonics

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours lab/tutorial per week. **Prohibitions:** ELEC3402, ELEC3405 **Assumed knowledge:** ELEC2401 Introductory Electronics or ELEC2104 Electronic Devices and Basic Circuits. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

This unit of study provides an introduction to the fundamental operation and design of transmitter and receiver subsystems for two broad classes of communications systems: those based on electronic transmission and those based on optical transmission. In the area of electronic communication subsystems, the course presents transmitter and receiver design. Topics relating to the transmitter comprise electronic oscillator sources, tuned electronic amplifiers, and modulators. Topics relating to receiver design comprise RF and IF frequency selective amplifiers, mixers, demodulators, phase-lock loops, feedback amplifiers, and high frequency RF and microwave communication amplifiers. In the area of optical communication subsystems, the course presents photonic transmitters and receivers. On the transmitter side this focuses on the principles of light generation in optical sources such as semiconductor lasers and light emitting diodes, electro-optic modulation of light, and optical amplifiers. On the receiver side, photodetectors, optical receivers, and front-end circuits are discussed. The principles and design of these subsystems are considered with reference to a basic optoelectronic communication link.

ELEC5739
Foundations of Communications

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 3 hours lab and tutorial per week. **Prohibitions:** ELEC3503 **Assumed knowledge:** Confidence in mathematical operation usually needed to handle telecommunications problems such as Fourier transform, fundamental in signals and systems theory, convolution, and similar techniques. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

This is an intermediate unit of study in telecommunications following on the general concepts studied in earlier units such as Signal and Systems and leading on to more advanced units such as Digital Communication Systems. Student will learn how to critically design and evaluate digital communication systems including the elements of a digital transmission system, understand the limitations of communications channels, different analog and digital modulation schemes and reasons to use digital techniques instead of analog, and the effect of noise and interference in performance of the digital communication systems. On completion of this unit, studentss will have sufficient knowledge of the physical channel of a telecommunications network to approach the study of higher layers of the network stack.

The following topics are covered. Introduction to communications systems, random signals and stochastic process, components, signals and channels, sampling, quantization, pulse amplitude modulation (PAM), pulse code modulation (PCM), quantization noise, time division multiplexing, delta modulation. Digital communications: baseband signals, digital PAM, eye diagram, equalization, correlative coding, error probabilities in baseband digital transmission, bandpass transmission, digital amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK) and quadrature shift keying (QPSK), error probabilities in bandpass digital transmission, a case study of digital communication systems. Introduction to information theory: fundamental limits in communications, channel capacity and channel coding, signal compression.

ELEC5740
Foundations of Data Comm & the Internet

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures, 2 hours tutorial per week. 2 hours of labs per fortnight. **Prohibitions:** ELEC3504, ELEC4501 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

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, ATM and OSI). Circuit switched and packet switched communication. Network node functions and building blocks. LAN, MAN and WAN technologies. ATM systems. Protocols fundamental mechanisms. The TCP/IP core protocols (IP, ICMP, DHCP, ARP, TCP, UDP etc.). Applications and protocols (FTP, Telnet, SMTP, HTTP etc.).

ELEC5741
Foundations of Embedded Computing

Credit points: 6 **Session:** Semester 1 **Classes:** 1 hour of lectures per week and 10 three hour labs. **Prohibitions:** ELEC2601 **Assumed knowledge:** Logic operations, theorems and Boolean algebra, data representation, number operations (binary, hex, integers and floating point), combinational logic analysis and synthesis, sequential logic, registers, counters, bus systems, state machines, simple CAD tools for logic design, basic computer organisation, the CPU, peripheral devices, software organisation, machine language, assembly language, operating systems, data communications and computer networks. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

The aim of this unit of study is to teach students about microprocessors and their use. This includes architecture, programming and interfacing of microcomputers, peripheral devices and chips, data acquisition, device monitoring and control and communications.

ELEC5742
Foundations: Internet Software Platforms

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours lecture and 2 hours tutorials per week **Prohibitions:** EBUS4001 **Assumed knowledge:** INFO1103, INFO2110 and INFO2120 or equivalent **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

This course 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 course: Presentation layer, Persistence layer, and Interoperability. The course 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.

ELEC5743
Foundations of E-Business Anal & Design

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours project work in class and 1 hour tutorial per week. **Prohibitions:** EBUS3003, EBUS3001 **Assumed knowledge:** INFO2120 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

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.

ELEC5744
Foundations of Digital Comm Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours lab/tutorial per week. **Prohibitions:** ELEC4502 **Assumed knowledge:** ELEC3505 Communications or equivalent **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

Digitally modulated signals: non-linear modulation methods, continuous phase FSK, continuous phase modulation. Modulated carrier data transmission: QPSK, QAM, MFSK, MSK. Trellis coded modulation and modem technologies. Spread spectrum, including frequency hopping and CDMA principles. Plus selected topics from: Optical communication systems - single and multi-channel systems, performance criteria and systems analysis. Satellite communications systems. Cellular mobile radio systems.

ELEC8900
Project

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project work - own time. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Students will work individually or in groups on an assigned project for the semester. The concepts covered depend on the nature of the project, but broadly cover research and inquiry, and information literacy.

ELEC8901
Project Part A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project work - own time **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Students will work individually or in groups on an assigned project for the semester. The concepts covered depend on the nature of the project, but broadly cover research and inquiry, and information literacy.

ELEC8902
Project Part B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project work - own time **Prerequisites:** ELEC8901 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Students will work individually or in groups on an assigned project for the semester. The concepts covered depend on the nature of the project, but broadly cover research and inquiry, and information literacy.

School of Information Technologies

COMP5028
Object-Oriented Design

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** INFO3220 **Assumed knowledge:** Intermediate level of object oriented programming such as Java **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment in the following sessions: Semester 2.

This unit introduces Object-Oriented Analysis and Design especially the principles of modelling through Rational Unified Process and agile processes using Unified Modeling Language (UML), both of which are industry standard. Students work in small groups to experience the process of object-oriented analysis, architectural design, object-oriented design, implementation and testing by building a real-world application.

Objectives: In this unit students will develop the ability to: identify how the system interacts with its environment; identify appropriate objects and their attributes and methods; identify the relationships between objects; write the interfaces of each object; implement and test the objects; read and write various UML diagrams including use case, class, and sequence diagrams; apply design patterns to standard problems.

COMP5045
Computational Geometry

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour scheduled small group class per week, plus 10 hours per week private work. **Prohibitions:** COMP4045 **Assumed knowledge:** Data structures, analysis of algorithms **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

In many areas of computer science - robotics, computer graphics, virtual reality, and geographic information systems are some examples - it is necessary to store, analyse, and create or manipulate spatial data. This course deals with the algorithmic aspects of these tasks: we study techniques and concepts needed for the design and analysis of geometic algorithms and data structures. Each technique and concept will be illustrated on the basis of a problem arising in one of the application areas mentioned above.

Textbooks
M. de Berg, et al "Computional Geometry: Algorithms and Applications", Springer (2000)

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour scheduled small-group class per week. **Prohibitions:** COMP4046 **Assumed knowledge:** Concepts of Linguistics, elementary statistics, AI techniques. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit deals with techniques for the automatic processing of natural languages (such as English, French, etc) and the engineering of such software systems. Engineering processes will be described in the context of methods for creating effective tools for information retrieval and extraction, question answering, classifying and clustering of the documents in a large corpora. Processing sub-systems for such tasks as tokenisation, lexical verification, part-of-speech tagging, parsing and word sense disambiguation will be described. Particular emphasis is given to methods that analyse the meaning in texts and the general application of machine learning methods to these topics. Various applications of these methods to research in health texts and other contexts being pursued in the University of Sydney will be explored.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour scheduled small-group class per week, plus 10 hours per week private work. **Prohibitions:** NETS4047 **Assumed knowledge:** Networking concepts, operating system

concepts, programming expertise. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This is an advanced course in HCI, Human Computer Interaction, with a focus on Pervasive Computing. It introduces the key aspects of HCI and explores these in terms of the new research towards creating user interfaces that disappear into the environment and are available pervasively, for example in homes, workplaces, cars and carried or work.

COMP5048
Information Visualisation

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hours per week, Tutorial 1 hour per week. **Prohibitions:** COMP4048 **Assumed knowledge:** Discrete mathematics, algorithms and complexity. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Information Visualisation and Graph Drawing aim to make good pictures of abstract information, such as stock prices, family trees, and software design diagrams. Well designed pictures can convey this information rapidly and effectively. The research challenge for Information Visualisation and Graph Drawing is to design and implement new algorithms that produce such pictures. Applications include visualisation of bioinformatics, social network, software visualisation and network visualisation. This unit will provide basic concepts, techniques and fundamental algorithms to achieve good visualisation of abstract information. Further, it will also provide opportunities for academic research and developing new methods for information visualisation.

COMP5105
Foundations of Data Structures

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 2hrs) per week **Prohibitions:** INFO1105 **Assumed knowledge:** HSC Mathematics Extension 1 or 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit will teach some powerful ideas that are central to quality software: data abstraction and recursion. It will also show how one can analyse the scalability of algorithms using mathematical tools of asymptotic notation. Contents include: both external "interface" view, and internal "implementation" details, for commonly used data structures, including lists, stacks, queues, priority queues, search trees, hash tables, and graphs; asymptotic analysis of algorithm scalability, including use of recurrence relations to analyse recursive code. This unit covers the way information is represented in each structure, algorithms for manipulating the structure, and analysis of asymptotic complexity of the operations. Outcomes include: ability to write code that recursively performs an operation on a data structure; experience designing an algorithmic solution to a problem using appropriate data structures, coding the solution, and analysing its complexity.

COMP5114
Digital Media Fundamentals

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Multimedia has become an indispensable part of our heterogeneous computing and communication environment. This unit provides and overview of coding and manipulating digital media, which mainly include image, audio and video. It introduces principles and current techniques such as multimedia data acquisition, analysis, processing and compression and management. It also elaborates different multimedia coding standards, various multimedia systems and cutting-edge multimedia applications.

COMP5116
Internet Protocols

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** ELEC5740 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

In this unit students will gain understanding of the fundamental architecture and protocols used in the TCP/IP protocol stack that is the foundation of the Internet. Furthermore, the unit will provide students with the insight needed to begin to design and analyse protocols in the context of their intended use.

Objectives: On completion of this unit students will have developed an understanding of the principles and practice of the layered model of communications architecture, the TCP/IP protocol stack and its component protocols, and various common techniques and tools for protocol analysis.

COMP5138
Database Management Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Assumed knowledge:** Intermediate level of object oriented programming such as Java. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study provides a conceptual and practical introduction to the use of common platforms that manage large relational databases. Students will understand the foundations of database management and enhance their theoretical and practical knowledge of the widespread relational database systems, as these are used for both operational (OLTP) and decision-support (OLAP) purposes. The unit covers the main aspects of SQL, the industry-standard database query language. Students will further develop the ability to create robust relational database designs by studying conceptual modelling, relational design and normalization theory. This unit also covers aspects of relational database management systems which are important for database administration. Topics covered include storage structures, indexing and its impact on query plans, transaction management and data warehousing.

Objectives: In this unit students will develop the ability to:

- Understand the foundations of database management;

- Strengthen their theoretical knowledge of database systems in general and relational data model and systems in particular;

- Create robust relational database designs;

- Understand the theory and applications of relational query processing and optimization;

- Study the critical issues in data and database administration;

- Explore the key emerging topics in database management.

COMP5206
Introduction to Information Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** INFO5210 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit provides a comprehensive introduction to information systems in organisations and the enabling role of information technology. The critical role of data and knowledge management will be covered from both conceptual and practical standpoints. Methods and techniques for analysing systems and eliciting user requirements will be emphasised. Key topics covered include: basic information systems concepts; systems approach and systems thinking; E-Business and E-Commerce; data and knowledge management; systems analysis and development methodologies; ethical, legal and social aspects of information technologies; and Web 2.0 and social computing. On completion of this unit students will have a good understanding of important information concepts; a deep understanding of the systems approach and its applicability; be able to develop skills to perform systems analysis in contemporary systems environments; have an understanding of major conceptual and technological developments in Information Systems.

COMP5211
Algorithms

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lectures and one 1 hour tutorial per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The study of algorithms is a fundamental aspect of computing. This unit of study covers data structures, algorithms, and gives an overview of the main ways of thinking used in IT from simple list manipulation and data format conversion, up to shortest paths and cycle detection in graphs. The objective of the unit are to teach basic concepts in data structure, algorithm, dynamic programming and program analysis. Students will gain essential knowledge in computer science.

COMP5212
Software Construction

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This is a programming unit of study focussing on the Python and C languages, with emphasis on the individual producing code that works correctly. Topics include: the memory model, and errors associated with that (including pointers, malloc/free, sizeof, stack vs heap); coding simple dynamic data structures (linked lists); debugging; use of Unix tools for managing programming activities such as testing; learning from manual entries for standard library functions and Unix commands.

Objectives: On completion of this unit students will have acquired programming skills and techniques applicable to the development of software used in areas such as networking, computer engineering, language translation, and operating systems.

COMP5213
Computer and Network Organisation

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study provides an overview of hardware and system software infrastructure including: compilers, operating systems, device drivers, network protocols, etc. It also includes user-level Unix skills and network usability. The objectives are to ensure that on completion of this unit students will have developed an understanding of compilers, operating systems, device drivers, network protocols, Unix skills and network usability.

COMP5214
Software Development in Java

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment in the following sessions: Semester 1.

This unit of study introduces software development methods, where the main emphasis is on careful adherence to a process. It includes design methodology, quality assurance, group work, version control, and documentation. It will suit students who do not come from a programming background, but who want to learn the basics of computer software.

Objectives: This unit of study covers systems analysis, a design methodology, quality assurance, group collaboration, version control, software delivery and system documentation.

COMP5318
Knowledge Discovery and Data Mining

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** (Lec 2hrs & Prac 1hr) per week **Assumed knowledge:** COMP5138 and familiarity with basic statistics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment in the following sessions: Semester 2.

Knowledge discovery is the process of extracting useful knowledge from data. Data mining is a discipline within knowledge discovery that seeks to facilitate the exploration and analysis of large quantities of data, by automatic or semiautomatic means. This subject provides a practical and technical introduction to knowledge discovery and data mining.

Objectives: Topics to be covered include problems of data analysis in databases, discovering patterns in the data, and knowledge interpretation, extraction and visualisation. Also covered are analysis, comparison and usage of various types of machine learning techniques and statistical techniques: clustering, classification, prediction, estimation, affinity grouping, description and scientific visualisation.

COMP5321
Logic and System Verification

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hours per week, Laboratory 1 hour per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

In many systems ensuring correctness is a major design concern. Formal methods have been successfully used in the design of hardware circuits and mission-critical software, e.g., model checking to verify the floating point units of Intel processors. This unit provides an introduction to logic and system verification. The main aims are (i) to learn about propositional and predicate logic, (ii) how logic is used to model systems, (iii) reason about the correctness of the systems, and (iv) case studies in hardware and software design are discussed.

COMP5338
Advanced Data Models

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 1hr) per week **Assumed knowledge:** COMP5138 or equivalent **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study gives a comprehensive overview of post-relational data models and of latest developments in database technology. Particular emphasis is put on spatial, temporal, and semi-structured data. The unit extensively covers the advanced features of SQL:2008, as well as XML and related standards such as XMLSchema, xPath, and xQuery. The last part is dedicated to current developments of advanced data management techniques. Besides in lectures, the advanced topics will be also studied with prescribed readings of database research publications.

COMP5347
e-Commerce Technology

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Assumed knowledge:** COMP5028 Object Oriented Analysis and Design **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit will focus on technological advances supporting the development of e-commerce applications and systems. This includes client and server side development of e-commerce applications. AJAX is the core client side technology covered in this course. Both server scripting and server page technology are covered as key server side technology. It will also examine the emerging trend of web services and its role in E-commerce systems. This unit aims at providing both conceptual understanding and hand-on experiences for the technologies covered.

COMP5348
Enterprise Scale Software Architecture

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Prac 1hr) per week **Assumed knowledge:** INFO3220 or COMP5028 or equivalent. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit covers topics on software architecture for large-scale enterprises. Computer systems for large-scale enterprises handle critical business processes, interact with computer systems of other organisations, and have to be highly reliable, available and scalable. This class of systems are built up from several application components, incorporating existing "legacy" code and data stores as well as linking these through middleware technologies, such as distributed transaction processing, remote objects, message-queuing, publish-subscribe, and clustering. The choice of middleware can decide whether the system achieves essential non- functional requirements such as performance and availability. The objective of this unit of study is to educate students for their later professional career and it covers

Software Architecture topics of the ACM/IEEE Software Engineering curriculum. Objective: The objective of this unit of study is to educate students for their later professional career and it covers topics of the ACM/IEEE Software Engineering curriculum.

COMP5415
Multimedia Authoring and Production

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit provides principles and practicalities of creating interactive and effective multimedia products. It gives an overview of the complete spectrum of different media platforms and current authoring techniques used in multimedia production. Coverage includes the following key topics: enabling multimedia technologies; multimedia design issues; interactive 2D & 3D computer animation; multimedia object modelling and rendering; multimedia scripting programming; post-production and delivery of multimedia applications.

COMP5416
Advanced Network Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** (Lec 2hrs & Prac 1hr) per week **Assumed knowledge:** ELEC3506 or equivalent **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The unit introduces networking concepts beyond the best effort service of the core TCP/IP protocol suite. Understanding of the fundamental issues in building an integrated multi-service network for global Internet services, taking into account service objectives, application characteristics and needs and network mechanisms will be discussed. Enables students to understand the core issues and be aware of proposed solutions so they can actively follow and participate in the development of the Internet beyond the basic bit transport service.

COMP5424
Information Technology in Biomedicine

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Tut 1hr) per week **Assumed knowledge:** Basic programming skills **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Information technology (IT) has significantly contributed to the research and practice of medicine, biology and health care. The IT field is growing enormously in scope with biomedicine taking a lead role in utilizing the evolving applications to its best advantage. The goal of this unit of study is to provide students with the necessary knowledge to understand the information technology in biomedicine. The major emphasis will be on the principles associated with biomedical digital imaging systems and related biomedicine data processing, analysis, visualization, registration, modelling, compression, management and communication. Specialist areas such as Picture Archiving and Communication Systems (PACS), computer-aided diagnosis (CAD), image-guided surgery (IGS), content-based medical image retrieval (CBMIR), and ubiquitous m-Health, etc. will be addressed. A broad range of practical integrated clinical applications will be also elaborated.

COMP5425
Multimedia Storage, Retrieval & Delivery

Credit points: 6 **Session:** Semester 1 **Classes:** One 2-hour lecture and 1 1hour prac per week. **Assumed knowledge:** Algorithms (equivalent to COMP5211). **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The explosive growth of multimedia data, including text, audio, images and video, has generated an extremely challenging job in effective and efficient storing, managing, retrieving and delivering this data across IT infrastructure. This unit provides students with the most updated knowledge in order to address these issues, from multimedia database to multimedia content delivery. The unit content principally covers multimedia data compression; low-level feature extraction; high-level semantic description; storage structures and management; similarity measurement, indexing, and retrieval; security for content distribution. Various applications will be discussed, including multimedia Internet search and video streaming.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** (Lec 2hrs & Prac 1hr) per week. **Assumed knowledge:** Equivalent of COMP5116 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit is intended to introduce and motivate the study of high performance computer systems. The student will be presented with the foundational concepts of parallel and distributed computing that are pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the computer systems and will also get an introduction to the principles of cloud computing. Students will gain skills in evaluating, experimenting with, and optimizing the performance of high performance computers. The unit also provides students with the ability to undertake more advanced topics and courses on high performance computing.

COMP5456
Computational Methods for Life Sciences

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour lecture, one 1 hour tutorial and one 2 hour lab per week. **Prohibitions:** COMP3456 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit brings together a wide range of skils that are routinely practised in bioinformatics, from the "hard" subjects of mathematics, statistics and computer science, to the "soft" subjects in the biological/health sciences and pharmacology. It covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research, and provides additional practice in the graduate attributes of Research and Inquiry, Information Literacy and Communication through analysis of scientific research, use of large bioinformatics data sets, and writing of reports.

COMP5615
Software Engineering Project

Credit points: 6 **Session:** Semester 2 **Classes:** One 1-hour meeting with supervisor, one 2-hour class, and meeting with client. **Prerequisites:** INFO6007 **Prohibitions:** COMP3615 and INFO3600 **Campus:** Camperdown/Darlington **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.

COMP5702
IT Research Project A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Eight hours of practical work per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Specialist/Elective/Project

COMP5703
Information Technology Project

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Eight hours of practical work per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Specialist/Elective/Project

COMP5704
IT Research Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Four hours of practical work per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Specialist/Elective/Project

COMP5705
Information Technology Short Project

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Main, Winter Main **Classes:** Four hours of practical work per week. **Prohibitions:** COMP5702, COMP5704 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This is a short 6cp IT project unit of study that can be taken either stand-alone as a short IT project during winter or summer schools, or as an internship-project as part of an industry-based scholarship such as the Faculty Postgraduate Industry Project Placement Scheme (PIPPS). The focus is on the development of a client-focused solution with proper project management and documentation. For such students who follow the internship model of one day a week over both semester 1 and semester 2, COMP5705 can be combined with COMP5706 IT Industry Placement Project.

COMP5706
IT Industry Placement Project

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Weekly meetings, and about 8 hours of independent study and project work per week. **Prohibitions:** COMP5702, COMP5703, COMP5704 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This is a short 6cp IT project unit of study that can be taken in combination with COMP5705 Information Technology Short Project by students taking an Industry-based scholarship such as the Faculty's Research Industry Placement Project Scholarship (RIPPS), which they split over one day a week over both semester 1 and semester 2.

INFO5001
System Analysis and Modelling

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours lecture and 2 hour lab per week. **Prohibitions:** INFO2110, ELEC3610 and ELEC5743 **Assumed knowledge:** Experience with a data model as in COMP5212 or COMP5214 or COMP5028 or COMP5138 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit provides a comprehensive introduction to the analysis of complex systems. Key topics are the determination and expression of system requirements (both functional and non-functional), and the representation of structural and behavioural models of the system in UML notations. Students will be expected to evaluate rqeuirements documents and models as well as producing them. This unit covers essential topics from the ACM/IEEE SE2004 curriculum, espcially from MAA Software Modelling and Analysis.

INFO5010
IT Advanced Topic A

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Late **Classes:** One 2 hour scheduled small-group class per week. **Prerequisites:** Permission of Head of School **Prohibitions:** INFO4010 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit will cover some topic of active and cutting-edge research within IT; the content of this unit may be varied depending on special opportunities such as a distinguished researcher visiting the University.

INFO5011
IT Advanced Topic B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour scheduled small-group class per week. **Prerequisites:** Permission of Head of School **Prohibitions:** INFO4011 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit will cover some topic of active and cutting-edge research within IT; the content of this unit may be varied depending on special opportunities such as a distinguished researcher visiting the University.

INFO5301
Information Security Management

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hrs of lecture, 1 hr of lab/tut per week **Assumed knowledge:** Basic IT knowledge of databases and networks. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit will provide a broad information architectural view of IT security. Topics covered will include (i) the relationship between security needs and organization structure, (ii) risk assessment, (iii) design and implementation of security policies (iv) compliance with industry standards (v) monitoring services for security at the network, computer and human level, (vi) response to security breaches and disaster recovery. The course will decouple itself from the traditional association of security with cryptography.

INFO5990
Professional Practice in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** (Lec 2hrs & Tut 1hr) per week **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This Unit of Study introduces the students to some of the concepts, standards and techniques associated with the current professional practice of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

INFO5991
Services Science Management and Eng

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 1 hour lecture and 2 hour tutorial/seminar per week. **Assumed knowledge:** INFO5990 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The service sector plays a dominant and growing role in economic growth and employment in most parts of the world and information technology (IT) is a key enabler of this. Services Science, Management and Engineering (SSME) takes a multi-disciplinary approach to services as socio-technical systems. This unit of study offers IT professionals an understanding of the role of IT-centric services in a social, economic and business context as well as knowledge of the principles of their design, engineering and management in a service-oriented computing framework. Delivery of the unit is driven by a critical approach to the literature and live case studies presented by industry professionals. The unit's learning outcomes are driven by stated industry needs.

INFO5992
Understanding IT Innovations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** 2hr Lecture & 1hr Tutorial per week. **Prohibitions:** PMGT5875 **Assumed knowledge:** INFO5990 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

An essential skill for an IT manager is the ability to keep up-to-date with emerging technologies, and be able to evaluate the significance of these technologies to their organisation's business activities. This unit of study is based around a study of current technologies and the influence of these technologies on business strategies. Important trends in innovation in IT are identified and their implications for innovation management explored. Major topics include: drivers of

innovation; the trend to open information ("open source") rather than protected intellectual property; and distribution of innovation over many independent but collaborating actors. On completion of this unit, students will be able to identify and analyse an emerging technology and write a detailed evaluation of the impact of this technology on existing business practices.

INFO5993
IT Research Methods

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour scheduled small-group class per week, plus private work (incllluding interaction with research supervisors). **Prohibitions:** INFO4990 **Assumed knowledge:** Elementary statistics **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit will provide an overview of the different research methods that are used in IT. Students will learn to find and evaluate research on their topic and to present their own research plan or results for evaluation by others. The unit will develop a better understanding of what research in IT is and how it differs from other projects in IT. This unit of study is required for students in IT who are enrolled in a research project as part of their Honours or MIT/MITM degree. It is also recommended for students enrolled or planning to do a research degree in IT and Engineering.

INFO6007
Project Management in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** INFS6014, PMGT5871 **Assumed knowledge:** INFS6000 or COMP5206 or INFO5990 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit of study covers the factors necessary for successful management of system development or enhancement projects. Both technical and behavioural aspects of project management are discussed. Potential topics of interest could include managing the system life cycle, system and database integration issues, system performance evaluation, managing expectations of team members, cost effectiveness analysis, scheduling and change management.

ISYS5050
Knowledge Management Systems

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour scheduled small-group class per week. **Prohibitions:** ISYS4050 **Assumed knowledge:** Information systems concepts, database concepts **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This unit will offer a comprehensive introduction to the emerging area of Knowledge Management (KM) from both the technological and organisational perspectives. A diverse range of published papers and other publications that deal with a variety of KM-related topics will be reviewed. Topics include KM: Conceptual Foundations; Taxonomies of organisational knowledge and KM mechanisms; Case/Field Studies of KM Initiatives; Ontologies; Sematic Web; Customer Relationship Management (CRM) systems; Communities-of-Practice; Knowledge Sharing/Open Source Software Development; and Social Network Analysis and KM.

General units offered by the Faculty

ENGG5001
Professional Development

Credit points: 6 **Session:** Semester 1 **Classes:** 1hr lectures, 1hr tutorials and workshops per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

This UoS is designed to provide graduate engineers studying for a Master's degree by coursework with an introduction to the professional engineering skills necessary to practice as an engineer. These include the various elements of engineering practice, an understanding of the role of the engineer in industry, teamwork and leadership skills, an understanding of the professional responsibilities of engineers, competence in verbal communication and presentations and in reading and writing reports, and an understanding of ethical considerations. The material, learning and assessment is tailored for graduates from Australian and overseas universities.

ENGG5011
Foundation Engineering Studies A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** no formal classes. regular meetings with supervisor will be required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Students will be allocated a specific project to cover assumed knowledge components for following postgraduate units of study.

ENGG5012
Foundation Engineering Studies B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** No formal classes. Regular meetings with supervisor is required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Students will be allocated a specific project to cover assumed knowledge components for following postgraduate units of study.

ENGG5013
Foundation Engineering Studies C

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** No formal classes. Regular meetings with supervisor are required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Students will be allocated a specific project to cover assumed knowledge components for following postgraduate units of study.

ENGG5014
Foundation Engineering Studies D

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time. Regular meetings with supervisor required. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Foundations studies covers content that may be assumed knowledge or prerequisite information for follow-on Master of Professional Engineering units. Completion of assigned project work in prescribed background material by the coordinators of the specialist programs will allow students to meet the entry requirements of the MPE degree.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) **Assumed knowledge:** General knowledge in science and calculus and have completed 24 credit points of specialist units of study in their selected discipline. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

The objective of this unit of study is to provide a comprehensive overview of the nature and causes of the environmental problems facing our planet. The aim is to give students an insight of the political, economical and social forces underlying environmental conflicts and assesses the competing approaches used to address these issues. The sustainable technology and green chemical processes will be introduced to the students. The course explains the interaction between energy, chemicals and materials and alternative methods to minimize wastes. The topics such as sustainable raw materials, sustainable energy sources, bioethanol, biodiesel, fuel cells, photochemistry, and electrochemistry are described. The aspects of designing a sustainable building, green technologies that minimizes the energy consumption, consider recycling and reducing the waste disposal using advanced process design, selection of environmentally friendly reagents, catalysts, solvents will be discussed during this course.

The knowledge is given to students to perform a sustainability impact assessment and to develop sustainability objectives and targets within an organisation. The students will assess the procedures that can be used to interact with stakeholders to identify and prioritise sustainability.

ENGG5203
Quality Engineering and Management

Credit points: 6 **Session:** Semester 2 **Classes:** Presentation 2.00 hours per week, Project Work - in class 2.00 hours per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This subject is designed to support Engineers in the implementation of engineering tasks in the workplace, It addresses the use of quality and systems assurance. It is designed to enable engineers entering practice from other related disciplines or with overseas qualifications to do so in a safe and effective way. The study program will include management of quality in research, design and delivery of engineering works and investigation, as well as of safe work practices and systems assurance.

ENGG5204
Engineering Professional Practice

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 1 hour per week, Tutorial 1 hour per week, Workgroup 1 hour per week. **Assumed knowledge:** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

An initial 3-week intense period of lectures will provide all students with the necessary underpinning knowledge. The remainder of the semester would be based on project and field work, requiring the application in, practice of all the generic skills, with teaching staff playing a continuing resource and mentor role.

The project-based learning approach will expose students, in teams, to a series of professional engineering practice challenges to which they must respond in the limited time common in industry. This will be complemented by a small number of individual learning experiences to ensure adequate competence at the individual level. Students will have a working competence in the various elements of engineering practice, and enhanced communication skills that will assist them in their other technical units of study.

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3hrs per week, E-Learning 1 hr per week. **Assumed knowledge:** Basic engineering or science knowledge. At least 2-3 years of work experience preferred. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

"This UoS teaches the fundamental knowledge on the importance, organizational context and professional practice in project management. It serves as an introduction to project management practices for non-PM students. For PM students, this UoS lays the foundation to progress to advanced PM subjects. Although serving as a general introduction unit, the focus has been placed on scope, time, cost, and integration related issues.

Specifically, the UoS aims to

1. introduce students to the institutional, organisational and professional environment for today's project management practitioners as well as typical challenges and issues facing them;

2. demonstrate the importance of project management to engineering and organizations;

3. demonstrate the progression from strategy formulation to execution of the project;

4. provide a set of tools and techniques at different stages of a project's lifecycle with emphasis on scope, time, cost and integration related issues;

5. highlight examples of project success/failures in project management and to take lessons from these;

6. consider the roles of project manager in the organization and management of people;

7. provide a path for students seeking improvements in their project management expertise.

Textbooks
Harvey Maylor (2008) Project Management. 4th ed, Prentice Hall.

ENGG5210
Research Methods in Engineering (Intro)

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr per week, Workgroup 5 hrs per week for part of semester. **Prohibitions:** INFO5993 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS is designed for research students enrolled in MPhil or PhD programs and runs for 13 weeks. Post-graduate coursework students thinking of joining such programs in the future may also enroll. This UoS provides candidates with a sound understanding of the overall research process from the formulation of a research proposal to writing a thesis. Any research involves problem definition, literature survey, execution of research and reporting in an appropriate manner. Students will write their own research proposal, critique a number of scientific papers and conduct their own literature survey. Students will also carry out assignments involving design of small experiments and learn how to best analyse data and report results. Time will be devoted to developing the communication skills through seminars. The UOS is delivered through lectures from the staff-in-charge and guest lecturers who have carried out significant engineering research. The student has to give a ten minutes seminar based on the literature search he/she has conducted.

ENGG5214
Management of Technology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture, Tutorial, Lab, E-learning **Assumed knowledge:** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS is designed to introduce students to the global context of much of contemporary engineering and the consequent strategic and operational issues. It will address the nature, characteristics and variety of risks of global businesses, the opportunities and pressures for effective strategies, and the many management challenges in international business. In particular it will focus on Australian consulting, logistics and construction engineering firms that are operating on a global basis.

ENGG5215
International Eng Strategy & Operations

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hours per week, Tutorial 2 hours per week, Project Work - in class 2 hours per week. **Assumed knowledge:** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS is designed to introduce students to the global context of much of contemporary engineering and the consequent strategic and operational issues. It will address the nature, characteristics and variety of risks of global businesses, the opportunities and pressures for effective strategies, and the many management challenges in international business. In particular it will focus on Australian consulting, logistics and construction engineering firms that are operating on a global basis.

ENGG5216
Management of Engineering Innovation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture, Tutorial, Lab, E-learning **Assumed knowledge:** As graduates, they will have a soundly based technical knowledge in engineering or a related area, life skills and work experience. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This unit is designed as enable students to grapple with the challenges of engaging in, facilitating and managing innovation and technology commercialisation. Key learning outcomes are: developing an understanding of the processes of management, and in particular of innovation, dealing with uncertain and inadequate information, how to communicate effectively to and motivate a group of people to work out what to do, and how to do it. Content will include the challenges of modern management; understanding of the new rules of international competitiveness; effects of globalisation on Australia's

economic performance; the competitiveness of Australian firms; the generation of employment and wealth; the changing requirements of the engineer; the engineer as manager and strategist; the role of innovation in business management; product innovation and commercialisation; IP recognition and management; starting a high-tech company.

ENGG5217
Industrial Placement

Session: Semester 1, Semester 2 **Classes:** no formal classes **Prerequisites:** Students will have completed a minimum of 48cp towards the MPE. **Campus:** Camperdown/Darlington **Mode of delivery:** Professional Practice

The MPE requires students to obtain industrial work experience of twelve weeks duration (60 working days) or its equivalent towards satisfying the requirements for award of the degree. Students can undertake their work experience in either Year 1 or 2, however, Year 2 is encouraged. Students may have prior work in an Engineering field carried out on completion of their undergraduate degree accepted as meeting the requirements of this component. Students must be exposed to professional engineering practice to enable them to develop an engineering approach and ethos, and to gain an appreciation of engineering ethics. and to gain an appreciation of engineering ethics. The student is required to inform the Faculty of any work arrangements by emailing the Graduate School of Engineering and Information Technologies. Assessment in this unit is by the submission of a portfolio containing written reports on the involvement with industry. For details of the reporting requirements, go to the faculty's Practical Experience portfolio web site.

ENGG5218
Research Dissertation

Credit points: 24 **Session:** Semester 1, Semester 2 **Classes:** Each student will be assigned an academic supervisor from their chosen stream or specialisation. Students will meet with an academic supervisor for approximately 1 hour per week for one semester. **Prerequisites:** Completion of a minimum of 48cp of MPE UOS and have received a WAM of 75% or greater **Corequisites:** ENGG5210 Introduction to Research Methods in Engineering **Prohibitions:** AMME5218 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1,2

ENGG5219
Research Project

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Students will be assigned a supervisor who they will meet with on a weekly basis to discuss their progress. **Prerequisites:** Students will have completed a minimum of 48cp towards the MPE. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The ability to plan, systemically conduct and report on a major research project is an important skill for professional engineers. This unit of study builds on technical competencies previously obtained, as well as making use of the report writing and communication skills the students have developed. In this unit of study, students are required to plan and begin work on a major research project, which is very often some aspect of a staff member's research interests. Some of the projects will be experimental in nature, while others may involve computer-based simulation, design or literature surveys. In this unit students will learn how to examine published and experimental data, set objectives, organize a program of work and devise an experimental or developmental program. The skills acquired will be invaluable to students undertaking engineering work. Students are expected to take the initiative when pursuing their research project. Department permission required for enrolment in the following session(s); 1, 2.

ENGG5220
Engineering Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Independent project work. **Prerequisites:** 48 credits from MPE degree program **Prohibitions:** ENGG5222, ENGG5223, ENGG5218, ENGG5219 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The ability to plan, systemically conduct and report on a major research project is an important skill for professional engineers. This unit of study builds on technical competencies previously obtained, as well as making use of the report writing and communication skills the students have developed. In this unit of study, students are required to plan and begin work on a major research project, which is very often some aspect of a staff member's research interests. Some of the projects will be experimental in nature, while others may involve computer-based simulation, design or literature surveys. In this unit students will learn how to examine published and experimental data, set objectives, organize a program of work and devise an experimental or developmental program. The skills acquired will be invaluable to students undertaking engineering work. Students are expected to take the initiative when pursuing their research project. Department permission required for enrolment in the following session(s); 1,2

ENGG5221
Engineering Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Independent project work. **Corequisites:** ENGG5220 **Prohibitions:** ENGG5222, ENGG5223, ENGG5218, ENGG5219 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

In this unit of study, students are required to plan and begin work on a major research project, which is very often some aspect of a staff member's research interests. Some of the projects will be experimental in nature, while others may involve computer-based simulation, design or literature surveys. In this unit students will learn how to examine published and experimental data, set objectives, organize a program of work and devise an experimental or developmental program. The skills acquired will be invaluable to students undertaking engineering work. Students are expected to take the initiative when pursuing their research project. Department permission required for enrolment in the following session(s); 1,2

ENGG5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Independent project work **Prerequisites:** Distinction Average in 48 credit points of MPE program **Prohibitions:** ENGG5220, ENGG5221, ENGG5218, ENGG5219 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1,2

ENGG5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Independent porject work. **Corequisites:** ENGG5222 **Prohibitions:** ENGG5220, ENGG5221, ENGG5218, ENGG5219 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1,2

ENGG5601
Greenhouse Gas Mitigation

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hour lecture and a tutorial each week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment. Note: Unit Administration: WebCT

Graduate unit of study designed for environmental engineering students, either M.E. or Grad. Cert. of GHG Mitigation

Keywords: Greenhouse science, energy efficiency, carbon sinks, climate change amelioration

Objectives: To develop an understanding of, the significance of carbon dioxide in climate; the role of increasing fossil fuel energy conversion efficiency; the international framework for carbon sinks; the size, cost, potential and nature of terrestrial and oceanic sinks of carbon; the amelioration of the impacts of climate change.

Outcomes: Students will be able to make recommendations of the most cost effective approach to enterprises meeting carbon dioxide limits expected to be imposed as a result of the Kyoto Protocol.

Textbooks
P. Riemer, A. Smith, K. Thambimuthu (1998). Greenhouse Gas Mitigation, Elsevier, Amsterdam. pp777.

ENGG5610
Environmental Studies at Tokyo

This unit of study is not available in 2011

Credit points: 6 **Session:** Semester 1 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

A graduate unit of study designed for environmental engineering students, either M.E.S. or Grad. Cert. of GHG Mitigation.

Keywords: Global environments, environmental technology, policy making.

Objectives: To make students familiar with environmental technology policy making, environmental engineering and energy engineering, and the planning of environmentally harmonising systems.

Outcomes: Students will be able to systematically discuss:

- Current topics concerning global environmental and energy issues;
- How to make world and national policy;
- Environmental technologies and their role in policy;
- Advanced environmental research;

and be able to produce a plan harmonising the conflicting requirements such as protection of the environment and development.

ENGG5701
Doctoral Thesis 1A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Candidate must have at least one meeting with supervisor per week **Corequisites:** ENGG5210 Research Methods in Engineering **Practical field work:** Must carry out at least 8 hous of research per week. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Candidates enrolled in this UoS will begin research on an approved project. The research may be performed in a candidate's place of employment on a project that has been approved by the Faculty. A supervisor from the Faculty of Engineering and Information Technologies will be appointed for the duration of the research project. The objective of this UoS is to provide a formal platform through which the candidate can complete a research project from a thorough review of the various stages of literature survey, research proposal, research plan, conduct of research, data analysis and presentation of outcomes.

ENGG5702
Thesis and Doctoral Seminar 1B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** No formal classes. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

In the doctoral seminar program the candidate must present the first of three research colloquia to his or her peers in the form of a a research proposal. The candidate will be able to give a thorough review of the various stages of literature survey, research proposal, research plan, conduct of research, data analysis and presentation of outcomes.

ENGG5703
Doctoral Thesis 2A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Candidate must have at least 1 meeting per week with supervisor. **Corequisites:** ENGG5701 **Practical field work:** Candidate must carry out at least a minimum of 8 hours per week on research. **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Candidates enrolled in this UoS will continue their research on their approved project as outlined in ENGG5701 Doctoral Thesis 1A.

ENGG5704
Thesis and Doctoral Seminar 2B

Credit points: 12 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The candidate must carry out research for the fourth semester of the Doctoral research program, and at the end of the semester, must present the second of the three research colloquia (of approximately half an hour's duration) to his or her peers as a work in progress seminar, one of which might be analogous to an oral defence of the nearly completed thesis. The Seminar will be considered in the annual progress report on progress.

ENGG5705
Thesis and Doctoral Seminar 3A

Credit points: 24 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The candidate must carry out research for the fifth semester of the degree, and present the third of the three research colloquia (of approximately half an hour's duration) one of which might be analogous to an oral defence of the nearly completed thesis to the academic staff and postgraduate students of the Faculty of Engineering and Information Technology.

ENGG5706
Thesis and Oral Defence

Credit points: 24 **Session:** Semester 1, Semester 2 **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Carry out research for the final semester, and at the end of the Semester, present the results of the research in a thesis of approximately 60,000 words. The candidate is required to present a final Seminar which is similar to an oral defence of the thesis before staff and research students of the Faculty of Engineering and Information Technology at the end of the semester.

Index by alpha code

B

C

E

Index by name

D

E

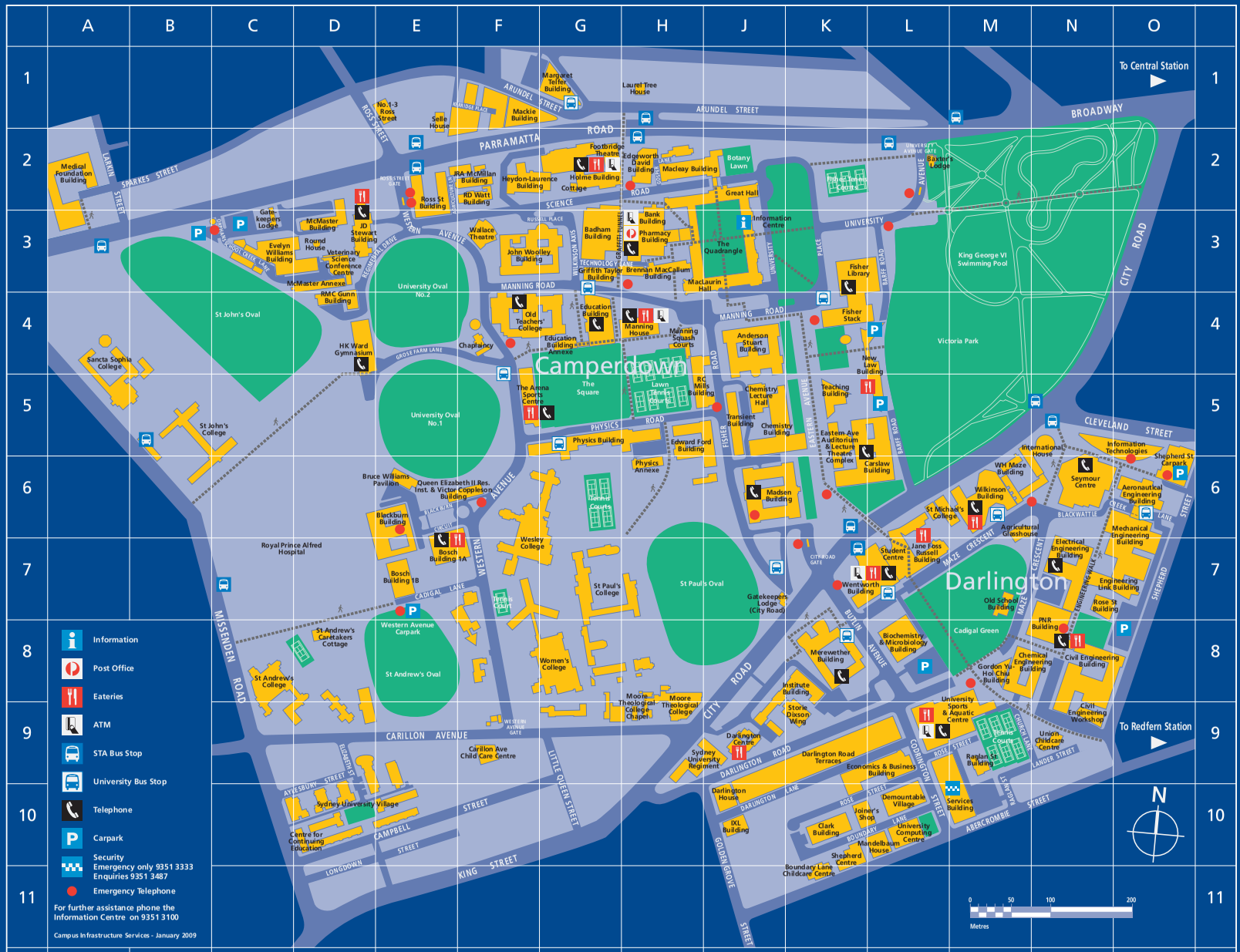
K

L

M

Map Code: 0102_MAIN

Camperdown and Darlington Campuses



Directory

University buildings

O6	Aeronautical Engineering Building
J4	Anderson Stuart Building
G3	Badham Building
H3	Bank Building
L2	Baxter's Lodge
L8	Biochemistry and Microbiology Building
E6	Blackburn Building
E7	Bosch Building 1A
E7	Bosch Building 1B
H3	Brennan MacCallum Building
E6	Bruce Williams Pavilion
L6	Carslaw Building
F4	Chaplaincy
M8	Chemical Engineering Building
J5	Chemistry Building
N8	Civil Engineering Building
N9	Civil Engineering Workshop
K10	Clark Building
J9	Darlington Centre
J10	Darlington House
K9	Darlington Road Terraces
L10	Demountable Village
K5	Eastern Avenue Auditorium & Lecture Theatre Complex
L9	Economics and Business Building
H2	Edgeworth David Geology Building
G4	Education Building
G4	Education Building Annexe
H5	Edward Ford Building
N7	Electrical Engineering Building
N7	Engineering Link Building
C3	Evelyn Williams Building
K3	Fisher Library
K4	Fisher Library Stack
G2	Footbridge Theatre
C3	Gatekeeper's Lodge
J7	Gatekeeper's Lodge (City Road)
M8	Gordon Yu-Hoi Chui Building
J2	Great Hall
G3	Griffith Taylor Building
D4	HK Ward Gymnasium
F2	Heydon-Laurence Building
G2	Holme Building
N5	Information Technologies
K8	Institute Building
N5	International House
J10	IXL Building
D3	JD Stewart Building
F2	JRA McMillan Building
L7	Jane Foss Russell Building
F3	John Woolley Building
L4	Law School
F1	Mackie Building
H3	MacLaurin Hall
H2	Macleay Building
G1	Margaret Telfer Building
J6	Madsen Building
H4	Manning House
H4	Manning Squash Courts
D3	McMaster Annexe
D3	McMaster Building
O6	Mechanical Engineering Building
A2	Medical Foundation Building
K8	Merewether Building
L4	New Law Building
E1	No. 1-3 Ross Street
M7	Old School Building
F4	Old Teachers' College
H3	Pharmacy Building
H6	Physics Annexe
G5	Physics Building
N8	PNR Building
E6	Queen Elizabeth II Research Institute
H5	RC Mills Building
F2	RD Watt Building
D4	RMC Gunn Building
M9	Raglan Street Building
N7	Rose Street Building
E2	Ross Street Building
G2	Science Road Cottage
E1	Selle House
M10	Services Building
N6	Seymour Centre
K10	Shepherd Centre
O6	Shepherd Street Carpark
K9	Storie Dixson Wing
L4	Sydney Law School
K5	Teaching Building
F5	The Arena Sports Centre
J3	The Quadrangle
J5	Transient Building
L10	University Computing Centre
M9	University Sports & Aquatic Centre
D3	Veterinary Science Conference Centre
E6	Victor Coppleson Building
F3	Wallace Theatre
K7	Wentworth Building
E7	Western Avenue Carpark
M6	WH Maze Building
M6	Wilkinson Building

Childcare centres

K11	Boundary Lane
F9	Carillon Avenue
N9	KU Union
H1	Laurel Tree House

Colleges & residential accommodation

J10	Darlington House
K9	Darlington Road Terraces
N5	International House
L10	Mandelbaum House
A4	Sancta Sophia College
C8	St Andrew's College
B5	St John's College
L6	St Michael's College
G7	St Paul's College
E1	Selle House
D10	Sydney University Village
F7	Wesley College
G8	Women's College

Computer Access Centres

H3	Brennan
G4	Education
K3	Fisher
N7	Link
L6	McGrath (Carslaw)
H3	Pharmacy

Cultural venues

H2	Macleay Museum
J3	Nicholson Museum
N6	Seymour Centre
K7	Sir Hermann Black Gallery
M6	Tin Sheds Gallery
J2	University Art Gallery

Faculties (offices)

F2	Agriculture, Food and Natural Resources
M6	Architecture
H3	Arts
K8	Economics & Business
G4	Education and Social Work
N7	Engineering
L4	Law
H5	Medicine
H3	Pharmacy
L6	Science
D3	Veterinary Science

Libraries

G3	Badham
H5	Burkitt-Ford
K3	Fisher
L4	Freehills Law Library
E7	Medical
H5	Schaeffer Fine Arts
L7	SciTech

Retail

H3	Australia Post Office
J9	Darlington Centre
G2	Holme Building
L7	Jane Foss Russell Building
H4	Manning House
F5	The Arena Sports Centre
M9	University Copy Centre
K7	University Health Service
M9	University Sports & Aquatic Centre
M9	University Co-op Bookshop
C3	Valentine Charlton Cat Centre
C3	Veterinary Hospital & Clinic
K7	Wentworth Building

Security

M10	Emergency Services
M10	Lost Property
M10	Traffic & Parking

Sports & recreational venues

K2	Fisher Tennis Courts
D4	HK Ward Gymnasium
H5	Lawn Tennis Courts
H4	Manning Squash Courts
F5	The Arena Sports Centre
G5	The Square
E5	University Oval No. 1
E3	University Oval No. 2
M9	University Sports & Aquatic Centre

Unions & associations (offices)

K7	Students' Representative Council (SRC)
M9	Sydney University Postgraduate Representative Association (SUPRA)
M9	Sydney Uni Sport & Fitness
G2	University of Sydney Union

University administration, centres & services

L7	Accommodation Service
H3	Alumni Relations Office
L7	Careers Centre
L7	Cashier
D10	Centre for Continuing Education
K7	Centre for English Teaching
H3	Chancellor
L7	Counselling Service
L7	Disability Services
L7	Equity Support Services
H2	Executive Offices
L7	Financial Assistance Office
G1	Financial Services
J3	Information Centre
L10	Information and Communications Technology Services
L7	International Office
L7	International Student Support Unit
G4	Learning Centre
L6	Mathematics Learning Centre
H2	Media Office
G1	Office of General Counsel
L7	Research Office
L7	Scholarships and Prizes Office
L7	Student Centre
L7	Student Support Services
K8	Summer School
K8	Support Sydney
M10	SydneyPeople – HR Service Centre
D9	SydneyPeople – Learning Solutions
E1	SydneyPeople – Unistaff
L7	Sydney Talent
O5	Sydnovate
F3	United States Studies Centre
G2	University of Sydney Venue Collection
C3	Veterinary Hospital & Clinic
H2	Vice-Chancellor

Course planner

Year	Semester	Unit of study 1 & credit points		Unit of study 2 & credit points		Unit of study 3 & credit points		Unit of study 4 & credit points		Total credit points
1	1									
	2									
2	summer									
	1									
	winter									
	2									
3	summer									
	1									
	winter									
	2									
4	summer									
	1									
	winter									
	2									
5	summer									
	1									
	winter									
	2									
								Total credit points		