THE UNIVERSITY OF
SYDNEY

FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGIES – POSTGRADUATE

HANDBOOK 2015

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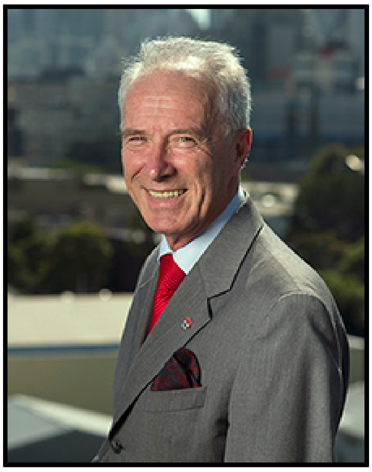
Contents

Welcome



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

Whether you want to qualify for a profession, enhance your career prospects or change careers, our professional postgraduate programs will help you achieve your goals.

In a global economy that places a premium on skills and innovation, well-qualified engineers, IT professionals and project managers are highly sought after. Our tailored and flexible teaching programs in career-related areas can help you achieve your goals. You'll be taught by experts in their fields, at one of the top 50 engineering and technology universities in the world.

We understand the importance of working closely with industry. Our courses are designed in collaboration with, and often taught by, industry specialists. Our degrees have a professional focus with accreditations from the Australian Computer Society, Engineers Australia and the Project Management Institute Global Accreditation Centre.

The faculty has developed international partnerships with key institutions, governments and other organisations around the world. Through this partner network we encourage you, our researchers and staff to engage in various forms of collaboration that deepen their understanding and knowledge and broaden their global outlook.

Welcome to our vibrant and international community. I hope you enjoy your educational journey with us.

Professor Archie Johnston
Dean, Faculty of Engineering and Information Technologies

Resolutions of the Senate

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, 2015. 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
RHENGINE	Doctor of Engineering	DEng	Published work
RPPHDENG	Doctor of Philosophy	PhD	Research
RMPHLENG	Master of Philosophy	MPhil	Research
MAENGINE	Master of Engineering	ME	72
MAINFTEC	Master of Information Technology	MIT	72
MAINFTMG	Master of Information Technology Management	MITM	72
	Master of Health Technology Innovation	MHTI	96
MAPROFEN	Master of Professional Engineering		
	Aerospace Engineering	MPE(Aerospace)	144
	Biomedical Engineering	MPE(Biomedical)	144
	Chemical and Biomolecular Engineering	MPE(Chemical & Biomolecular)	144
	Civil Engineering	MPE(Civil)	144
	Electrical Engineering	MPE(Electrical)	144
	Fluids Engineering	MPE(Fluids)	144
	Geomechanical Engineering	MPE(Geo)	144
	Mechanical Engineering	MPE(Mechanical)	144
	Power Engineering	MPE(Power)	144
	Software Engineering	MPE(Software)	144
	Structural Engineering	MPE(Structural)	144
	Telecommunications Engineering	MPE(Telecoms)	144
MAPRJMGT	Master of Project Management	MPM	72
MAPRJLEA	Master of Project Leadership	MPL	48
BPCSTECN	Bachelor of Computer Science and Technology*		
	Computer Science	BCST(ComputerScience)	144
	Information Systems	BCST(InformationSystems)	144
BPCSTECN	Bachelor of Computer Science and Technology (Advanced)*		
	Computer Science	BCST(Adv)(ComputerScience)	144
	Information Systems	BCST(Adv)(InformationSystems)	144
BUENGINE	Bachelor of Engineering^		
	Aeronautical Engineering	BE(Aeronautical)	192
	Aeronautical Engineering (Space)	BE(Aeronautical)(Space)	192
	Biomedical Engineering	BE(Biomedical)	192
	Chemical and Biomolecular Engineering	BE(Chemical & Biomolecular)	192
	Civil Engineering	BE(Civil)	192
	Civil Engineering (Construction Management)	BE(Civil)(Construction Management)	192
	Civil Engineering (Environmental)	BE(Civil)(Environmental)	192
	Civil Engineering (Geotechnical)	BE(Civil)(Geotechnical)	192
	Civil Engineering (Structures)	BE(Civil)(Structures)	192
	Electrical Engineering	BE(Electrical)	192
	Electrical Engineering (Computer)	BE(Electrical)(Computer)	192

Code	Course title & stream	Abbreviation	Credit points
	Electrical Engineering (Power Engineering)	BE(Electrical)(Power)	192
	Electrical Engineering (Telecommunications)	BE(Electrical)(Telecommunications)	192
	Mechanical Engineering	BE(Mechanical)	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(Project Eng & Mngt)(Civil)	192
	Software Engineering	BE(Software)	192
BHENGINE	Bachelor of Engineering Honours		
	Aeronautical Engineering	BEHons(Aeronautical)	192
	Aeronautical Engineering (Space)	BEHons(Aeronautical)(Space)	192
	Biomedical Engineering	BEHons(Biomedical)	192
	Chemical and Biomolecular Engineering	BEHons(Chemical and Biomolecular)	192
	Civil Engineering	BEHons(Civil)	192
	Civil Engineering (Construction Management)	BEHons(Civil)(Construction Management)	192
	Civil Engineering (Environmental)	BEHons(Civil)(Environmental)	192
	Civil Engineering (Geotechnical)	BEHons(Civil)(Geotechnical)	192
	Civil Engineering (Structures)	BEHons(Civil)(Structures)	192
	Electrical Engineering	BEHons(Electrical)	192
	Electrical Engineering (Computer)	BEHons(Electrical)(Computer)	192
	Electrical Engineering (Power Engineering)	BEHons(Electrical)(Power)	192
	Electrical Engineering (Telecommunications)	BEHons(Electrical)(Telecommunications)	192
	Mechanical Engineering	BEHons(Mechanical)	192
	Mechanical Engineering (Space)	BEHons(Mechanical)(Space)	192
	Mechatronic Engineering	BEHons(Mechatronic)	192
	Mechatronic Engineering (Space)	BEHons(Mechatronic)(Space)	192
	Project Engineering and Management (Civil)	BEHons(Project Eng & Mngt)(Civil)	192
	Software Engineering	BEHons(Software)	192
BPENCHBM	Bachelor of Project Management	BPM	144
BPPRMCES	Bachelor of Project Management (Civil Engineering Science)	BPM(Civil Engineering Science)	144
BPPRMSES	Bachelor of Project Management (Software)	BPM(Software)	144
BPPRMBEN	Bachelor of Project Management (Built Environment)	BPM(Built Environment)	144
BPINFTEC	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
MAINFITM1000	Master of Information Technology/Master of Information Technology Management	MIT/MITM	96
BPENGART-01	Bachelor of Engineering^/Bachelor of Arts*	BE/BA	240
BPENGCOM-01	Bachelor of Engineering^/Bachelor of Commerce*	BE/BCom	240
BPENGDAR-01	Bachelor of Engineering^/Bachelor of Design in Architecture*	BE/BDesArch	240
BUENGLAW-01	Bachelor of Engineering^/Bachelor of Laws^	BE/LLB	288
BPENGMSC-01	Bachelor of Engineering^/Bachelor of Medical Science*	BE/BMedSci	240
BPENGSCI-01	Bachelor of Engineering^/Bachelor of Science*	BE/BSc	240
BHENGART-01	Bachelor of Engineering Honours/Bachelor of Arts	BEHons/BA	240

Code	Course title & stream	Abbreviation	Credit points
BHENGCOM-01	Bachelor of Engineering Honours/Bachelor of Commerce	BEHons/BCom	240
BHENGDAR-01	Bachelor of Engineering Honours/Bachelor of Design in Architecture	BEHons/BDesArch	240
BHENGLAW-01	Bachelor of Engineering Honours/Bachelor of Laws	BEHons/LLB	288
BHENGMSC-01	Bachelor of Engineering Honours/Bachelor of Medical Science	BEHons/BMedSci	240
BHENGSCI-01	Bachelor of Engineering Honours/Bachelor of Science	BEHons/BSc	240
BPITCART-01	Bachelor of Information Technology^/Bachelor of Arts*	BIT/BA	240
BPITCCOM-01	Bachelor of Information Technology^/Bachelor of Commerce*	BIT/BCom	240
BPITCLAW-01	Bachelor of Information Technology^/Bachelor of Laws^	BIT/LLB	288
BPITCMSC-01	Bachelor of Information Technology^/Bachelor of Medical Science*	BIT/BMedSc	240
BPITCSCI-01	Bachelor of Information Technology^/Bachelor of Science*	BIT/BSc	240
BPENGPRM-01	Bachelor of Engineering^/Bachelor of Project Management*	BE/BPM	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
GNCOMPUT-02	Graduate Diploma in Computing	GradDipComp	60
GNENGINE-01	Graduate Diploma in Engineering	GradDipEng	36
GNENPROF-01	Graduate Diploma in Engineering (Professional Engineering)	GradDipEng(ProfEng)	48
GNINFTEC-02	Graduate Diploma in Information Technology	GradDipIT	48
GNINFTMG-02	Graduate Diploma in Information Technology Management	GradDipITM	48
GNPRJMGT-01	Graduate Diploma in Project Management	GradDipPM	36
GNPRJLEA-01	Graduate Diploma in Project Leadership	GradDipPL	36
	Graduate Diploma in Health Technology Innovation	GradDipHTI	~~48~~60

5 Graduate certificates

Code	Course title	Abbreviation	Credit points
GCENGINE-01	Graduate Certificate in Engineering	GradCertEng	24
GCINFTEC-02	Graduate Certificate in Information Technology	GradCertIT	24
GCINFTMG-02	Graduate Certificate in Information Technology Management	GradCertITM	24
GCPRJMGT-01	Graduate Certificate in Project Management	GradCertPM	24
GCPRJLEA-01	Graduate Certificate in Project Leadership	GradCertPL	24

Resolutions of the Faculty

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

Terminology: In the following resolutions, all reference to the Bachelor of Engineering degree applies to both the Bachelor of Engineering and Bachelor of Engineering Honours, except where otherwise indicated.

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 24 credit points in either semester one or two;

(b) No more than 12 credit points in the summer session and 6 credit points in the winter session;

(c) In first year, a student may only enrol in level 1000 units of study;

(d) In second year, a student may only enrol in level 1000 and/or level 2000 units of study;

(e) A student shall enrol in lower year level core units of study as a priority above any higher year level units of study irrespective of meeting any prerequisite requirements of the higher year units.

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, Chemical and Biomolecular, Civil, 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 Biomedical, Electrical, 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.

(c) Transfer into the Bachelor of Project Management is not part of the flexible first year program.

(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
BEHons(Aero)	A	65
BEHons(Aero)(Space)	A	75
BEHons(Biomedical)	B	70
BEHons(Chem)	A	always allowed
BEHons(Civil)	A	always allowed
BEHons(Civil)(Construction)	A	65
BEHons(Civil)(Environmental)	A	65
BEHons(Civil)(Geotechnical)	A	65
BEHons(Civil)(Structures)	A	65
BEHons(Electrical)	B	always allowed
BEHons(Electrical) (Computer)	B	65
BEHons(Electrical)(Power)	B	65
BEHons(Electrical)(Telecom)	B	65
BEHons(Mechanical)	A	always allowed
BEHons(Mech)(Space)	A	75

Degree/Stream	Flexible entry program	AAM requirement
BEHons(Mechatronics)	B	70
BEHons(Mechatronics)(Space)	B	75
BEHons(Project Mgt)(Civil)	A	65
BEHons(Software)	B	65
BCST	B	always allowed
BCST(Adv)	B	70
BIT	B	70

3 Transferring Streams or Degrees

(1) Students admitted to specific undergraduate Engineering, IT or Project Management single degrees or streams, and the combined BEHons/BPM can apply for transfer between these degrees or stream. Approval is required from the Dean (or his/her delegate) for any case; or by the Head of School (or his/her delegate) or the program director responsible for the particular stream or degree. Students in combined degrees can change the stream of the BEHons portion of their combined degree in accordance with this sub-clause. 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 into or between any of the faculty's undergraduate combined degrees (except into BEHons/BPM as covered in part(1) above) or any other course outside the administration of the Faculty must apply to the Universities Admissions Center 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 BEHons, 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) BEHons or BPM 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; a minimum of 1 semester and a maximum of 4 semesters

(e) A student must complete all the requirements for a graduate diploma within four calendar years of first enrolment; a minimum of 2 semesters and a maximum of 6 semesters

(f) A student must complete all the requirements for a master's degree within six calendar years of first enrolment. A minimum of 2 semesters and a maximum of 8 semesters.

(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 Infomation Technologies 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 Honours/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) or Bachelor of Project Management is 48 credit points; and

(c) For prior learning at the University of Sydney at postgraduate level credit may be given subject to the approval of the Faculty and to the following conditions:

(i) where no award has been conferred, credit may be transferred in full to the Graduate Diploma and Master degree;

(ii) if an award has been conferred credit to a limit of 12 credit points may be transferred.

(d) For prior learning at postgraduate level at an external institution recognised by the University of Sydney

(i) where no award has been conferred credit to a maximum of 50 percent of the degree may be approved, provided units of study have been completed at credit average and are equivalent to units of study offered under the degree being taken;

(ii) if an award has been conferred credit to a maximum of 12 credit points may be approved provided units of study have been completed at credit average and are equivalent to units of study offered under the degree being taken;

(iii) credit will not be granted for recognised prior learning older than 10 years at the time of first enrolment.

(e) 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 Information Technologies 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 percent 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 percent.

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

(1) The Engineering Weighted Average Mark (EWAM) is calculated by the formula:

Formula
EWAM= (Wi x CPi x Mi) / (Wi x CPi)

where

(a) Wi is the weighting given by 0 for 1000 level units of study, 2 for 2000 level units, 3 for 3000 level units and 4 for 4000 level or above units.

(b) CPi is the number of credit points for the unit of study.

(c) Mi is the mark achieved for the unit of study.

All attempts at units of study are included except for: pass/fail units of study; units of study with a grade of DNF; and credited units of study from other institutions.The mark used for units of study with a grade of AF or DF is zero. For combined degree students, units of study taken as part of the second degree are included.

(2) The Engineering Integrated Honours Weighted Average Mark (EIHWAM) is calculated using the same formula as the EWAM in Clause 15.1 with the additional condition that thesis units of study are given a double weighting of 8.

(3) The Weighted Average Mark is calculated by the formula:

Formula
WAM= (CPi x Mi) / (CPi)

Part 5: Other

16 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2015 and students who commenced their candidature prior to 1 January, 2015 who elect to proceed under these resolutions.

(2) Students who commenced prior to 1 January, 2015 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Master of Engineering

Course overview

The Master of Engineering will allow you to build on your existing engineering undergraduate degree by developing specialised technical knowledge.

The course also includes four professional engineering subjects that will enhance your leadership and entrepreneurial capabilities, providing you with greater opportunity for career advancement.

Course structure

This master's program comprises core units of study, along with electives to broaden your knowledge. A sequence of specialist units is completed that comprise a major in your chosen field.

There is a strong focus on project work to enhance self-directed learning and leadership skills.

Both professional and research pathways are available within all majors to allow you to achieve outcomes that are directly related to industry, or to complete a research project as preparation for a higher research degree in your chosen engineering field.

Master of Engineering

Course rules

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
GCENGINE-01	Graduate Certificate in Engineering
GNENGINE-01	Graduate Diploma in Engineering
MAENGINE-03	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) a Bachelor of Engineering from the University of Sydney with a credit average or equivalent qualification, or
(b) a Bachelor of Engineering from the University of Sydney, or equivalent, and 5 years' relevant work experience, subject to the satisfaction of the Dean or their delegate.
(3) Admission to the Graduate Diploma in Engineering requires:
(a) a Bachelor of Engineering from the University of Sydney with a credit average or equivalent qualification; or
(b) completion of the embedded graduate certificate, or
(c) a Bachelor of Engineering from the University of Sydney or equivalent, and 5 years' relevant work experience, subject to the satisfaction of the Dean or their delegate.
(4) Admission to the Master of Engineering requires:
(a) a Bachelor of Engineering from the University of Sydney with a credit average or equivalent qualification; or
(b) completion of the embedded graduate diploma or graduate certificate with a minimum credit average; or
(c) a Bachelor of Engineering from the University of Sydney or equivalent, or 5 years' relevant work experience, subject to the satisfaction of the Dean or their nominee.
(d) If a candidate has received approval to transfer from the Master of Professional Engineering to the Master of Engineering, they may only receive credit for units that been completed under the prescribed unit tables for the Master of Engineering.
(5) If a candidate does not have the equivalent qualification with a credit average, they may be admitted to the Master of Engineering, Graduate Diploma or the Graduate Certificate subject to the discretion of the Dean or their delegate.

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 72 credit points, including:
(a) 24 credit points of core units of study as listed in the Master of Engineering Units table;
(b) At least 12 credit points of research units of study in the discipline of the candidate's major; and
(c) At least 24 credit points of units of study in the discipline of the student's major as listed in the Master of Engineering unit of study table;
(d) A maximum of 12 credit points of elective units of study, subject to the approval of the Head of School most associated with the discipline of the student's major;

(e) If a reduction in the volume of learning of 24 credits is given, then the candidate must complete a minimum 12 credit points of core, a minimum of 12 credit points of specialist units and a minimum of 12 credit points of research units, with zero credit points of electives.

(f) Candidates must complete a major in one of the areas listed below.

6 Majors

Completion of a major is a requirement of the Master of Engineering. A major requires the completion of prescribed units of study listed in the table for that major. The majors available are:

(I) Automation & Manufacturing Systems
(II) Biomedical Engineering
(III) Chemical and Biomolecular Engineering
(IV) Civil Engineering
(V) Electrical Engineering
(VI) Sustainability and Environmental Engineering
(VII) Fluids Engineering
(VIII) Geomechanical Engineering
(IX) Mechanical Engineering
(X) Power Engineering
(XI) Structural Engineering
(XII) Telecommunications Engineering

7 Credit

A candidate who has received direct admission to the Master of Engineering and has a Bachelor or Engineering (Honours) or a Bachelor of Engineering (Pass) with a credit average may be eligible to receive up to 24 credit points of advanced standing subject to the discretion of the Dean.

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, 2015 and students who commenced their candidature prior to 1 January, 2015 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2015 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Automation and Manufacturing Systems

Course overview

A postgraduate major in Automation and Manufacturing Systems will allow you to apply engineering principles in order to understand, modify or control the manufacture, delivery and maintenance of technology components in a wide range of industries.

You will learn how to develop and maintain systems that optimise productivity, manage process timelines and ensure quality control.

You will be able to evaluate the appropriate usage of materials including manufacture of recycled products and the use of advanced materials.

Course requirements

To meet requirements for the Master of Engineering majoring in Automation and Manufacturing Systems a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- A minimum of 12 credit points of research units
- A maximum of 12 credit points of elective units.

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL) need to complete 48 credit points of core/specialist/research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit our course and unit of study portal CUSP at http://cusp.sydney.edu.au.

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Automation and Manufacturing Systems			
To meet requirements for the Master of Engineering majoring in Automation and Manufacturing Systems a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
AERO9760 **Spacecraft and Satellite Design**	6	**N** AERO5760	Semester 2
AMME5310 **Engineering Tribology**	6	**A** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261)	Semester 1
AMME5510 **Vibration and Acoustics**	6	**A** (AMME2301 OR AMME9301) AND AMME2200 AND (AMME2500 OR AMME9500) *Note: Department permission required for enrolment*	Semester 2
AMME5520 **Advanced Control and Optimisation**	6	**A** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **P** AMME3500 OR AMME5501 OR AMME9501	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. *Note: Department permission required for enrolment*	Semester 2
AMME5902 **Advanced Computer Aided Manufacturing**	6		Semester 2
AMME5912 **Crash Analysis and Design**	6	**A** Computer Aided Drafting, Basic FEA principles and Solid Mechanics	Semester 1
AMME5951 **Fundamentals of Neuromodulation**	6	**A** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent.	Semester 1
MECH5416 **Advanced Design and Analysis**	6	**A** 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	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MECH5720 **Sensors and Signals**	6	**A** Strong MATLAB skills **N** MECH4720	Semester 2
MTRX5700 **Experimental Robotics**	6	**A** Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed. **P** (AMME3500 OR AMME9501) AND MTRX3700	Semester 1
Research units			
All candidates are required to complete a minimum of 12 credit points from the following units:			
AMME5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study).	Semester 1 Semester 2
AMME5021 **Capstone Project B**	6	**C** AMME5020	Semester 1 Semester 2
AMME5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2
AMME5222 **Dissertation A**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2
AMME5223 **Dissertation B**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2
With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace AMME5020, AMME5021 and 12 cp of electives with AMME5222 & AMME5223 Dissertation A & B.			
Elective units			
Candidates may complete a maximum of 12 credit points from the following units: Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director. Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.			
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field. *Note: Department permission required for enrolment* *Department Permission required for Enrolment*	Semester 2
AERO5200 **Advanced Aerodynamics**	6	**A** BE in the area of Aerospace Engineering or related Engineering field. **P** AERO5210 OR AERO9260 OR AERO3260 *Note: Department permission required for enrolment*	Semester 1
AERO9301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field. **P** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **N** AERO5301	Semester 1
AERO5400 **Advanced Aircraft Design Analysis**	6	**A** (AERO1400, AERO3260, AERO3261, AERO3360, AERO3465, AERO3560, AERO4460) or equivalent. **P** AERO3460 OR AERO5410 OR AERO9460 **N** : AERO4491	Semester 2
AERO5500 **Flight Mechanics Test and Evaluation Adv**	6	**A** BE in the area of Aerospace Engineering or related Engineering field. **P** AERO5510 OR AERO9560 OR AERO3560	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
AMME5271 **Computational Nanotechnology**	6	**A** The students will require 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. *Note: Department permission required for enrolment*	Semester 2
AMME5101 **Energy and the Environment**	6	**P** 24 credits of 3000-level or above units of study	Semester 1
AMME9961 **Biomechanics and Biomaterials**	6	**A** Chemistry, Biology, Materials Engineering, and Engineering Design at least at the Junior level. **N** AMME5961	Semester 2
AMME9971 **Tissue Engineering**	6	**A** 6 credit points of junior biology, 6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent. **N** AMME5971 *The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of junior and intermediate biology and thus students will already have practical hands-on biological training. The purpose of this UoS is to elaborate the theory and latest developments of this very new field of tissue engineering, thereby building on the existing practical and theoretical knowledge base the students have in cell biology.*	Semester 1
AMME9981 **Computational Biomedical Engineering**	6	**A** AMME9301, AMME9302, AMME9500, and MECH9361. **N** AMME5981 *The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME9990 **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. **N** AMME5990 *The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.*	Semester 1
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. *Note: Department permission required for enrolment*	Semester 1
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July
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. **P** MECH3260 **N** MECH4255	Semester 2
MECH5265 **Advanced Combustion**	6	**A** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **P** (MECH3260 AND MECH3261) OR MECH5262 OR MECH9260	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. **P** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) *Note: Department permission required for enrolment*	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 *The UoS covers the key knowledge of most smart materials such as dielectric, piezoelectric, magneto-electric and shape memory materials. Each student participates in a couple of group projects relevant to characterization of structure-property relationship of functional structures with desired performance. Under the guidance of the supervisor, the student will learn how to develop a proposal, how to do the project investigation and how to prepare and carry out the technical communications (writing and oral). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.*	Semester 2
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310 *Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.*	Semester 1

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Automation and Manufacturing Systems

To meet requirements for the Master of Engineering majoring in Automation and Manufacturing Systems a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

AERO9760
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. **Prohibitions:** AERO5760 **Assessment:** Through semester assessment (100%) **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.

AMME5310
Engineering Tribology

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs; Tutorial 3 hrs/week; Seminar 3 hrs/week. **Assumed knowledge:** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim is to teach students in the undergraduate and postgraduate levels basic concepts about friction, lubrication and wear applicable to design and operation of mechanical systems used in engineering, industrial, and modern applications. Examples of these systems are lubrication of internal combustion engines, gearboxes, artificial hip/knee joints, and micro/nano electromechanical systems.

AMME5510
Vibration and Acoustics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** (AMME2301 OR AMME9301) AND AMME2200 AND (AMME2500 OR AMME9500) **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This UoS should prepare the student to be able to undertake vibration and acoustic measurement calculations for industry design situations.

The unit aims to introduce a number of new concepts required for analysis of vibrations and acoustics. The response of structure under different dynamic forces, including human and aerodynamic, will be investigated. A number of hands-on experiments will be performed to allow an understanding of the concepts and applicability.

The acoustics component will include: basic acoustics theory, sound generation and propagation, impedance, absorbing materials, industrial noise sources, isolation methods of noise control, enclosures, instrumentation and measurement, frequency analysis, noise regulations and computational acoustics.

AMME5520
Advanced Control and Optimisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Research 1 hr/week. **Prerequisites:** AMME3500 OR AMME5501 OR AMME9501 **Assumed knowledge:** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces engineering design via optimization, i.e. finding the "best possible" solution to a particular problem. For example, an autonomous vehicle must find the fastest route between two locations over a road network; a biomedical sensing device must compute the most accurate estimate of important physiological parameters from noise-corrupted measurements; a feedback control system must stabilize and control a multivariable dynamical system (such as an aircraft) in an optimal fashion.

The student will learn how to formulate a design in terms of a "cost function", when it is possible to find the "best" design via minimization of this "cost", and how to do so. The course will introduce widely-used optimization frameworks including linear and quadratic programming (LP and QP), dynamic programming (DP), path planning with Dijkstra's algorithm, A*, and probabilistic roadmaps (PRMs), state estimation via Kalman filters, and control via the linear quadratic regulator (LQR) and Model Predictive Control (MPC). There will be constant emphasis on connections to real-world engineering problems in control, robotics, aerospace, biomedical engineering, and manufacturing.

AMME5602
Product Life Cycle Design

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 5 hrs/week. **Assumed knowledge:** Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This subject covers 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.

AMME5902
Advanced Computer Aided Manufacturing

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class, Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory, Seminar, **Assessment:** Through semester assessment (100%) **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

oHow to successfully complete a CAD/CAM and CNC mill based project.

oManufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;

oThe science in designing and selecting a manufacturing method.

oHow to effectively present your ideas and outcomes using oral and report based methods.

It is expected that through your hard work in the semester, you will find

oEnhanced learning by real-world problems.

oImproved comprehensive skill in manufacturing design.

AMME5912
Crash Analysis and Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - own time, **Assumed knowledge:** Computer Aided Drafting, Basic FEA principles and Solid Mechanics **Assessment:** Through semester assessment (100%) **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-PreSys, 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.

AMME5951
Fundamentals of Neuromodulation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Implantable microelectronic devices functioning either as nerve stimulators or nerve blockers comprise one of the largest markets in the global medical device industry. The aim of this unit of study is to give students a complete overview of the underlying technology (microelectronics, encapsulation biomaterials, electrode biomaterials, electrode-neural interactions, inductive power systems and data links, signal processing) and an expert review of the major technological applications on the market, which include Cochlear implants, pacemakers and implantable defibrillators, deep brain stimulators, pain control nerve blockers, bionic eye implants, functional electrical stimulation systems. The unit will also review emerging applications such as gastrointestinal disorders, obesity; vagal nerve stimulation - epilepsy, depression, carotid artery stimulation - hypertension, spinal cord stimulation - ischemic disorders, angina, peripheral vascular disease, incontinence, erectile dysfunction. The unit will conclude with a snapshot of the future: "brain on a chip" progress, nerve regrowth, neurotropins, drug/device combinations. This is a Master of Professional Engineering Unit of Study intended for biomedical engineering students with an interest in working in the medical device industry in the large market sector area of implantable electronic devices.

MECH5416
Advanced Design and Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

1. 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.

2. 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.

3. 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.

MECH5720
Sensors and Signals

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 3 hrs/week; Project Work - own time 2 hrs/week; Presentation 2 hrs; Laboratory 2 hrs; Tutorial 2 hrs/week. **Prohibitions:** MECH4720 **Assumed knowledge:** Strong MATLAB skills **Assessment:** Through semester assessment (75%) Final Exam (25%) **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: Convolution, The Fourier Transform, Modulation (FM, AM, FSK, PSK etc), Frequency shifting (mixing)

b) PASSIVE SENSORS: Infrared Radiometers, Imaging Infrared, Passive Microwave Imaging, Visible Imaging & Image Intensifiers

c) ACTIVE SENSORS THE BASICS: Operational Principles, Time of flight (TOF) Measurement & Imaging of Radar, Lidar and Sonar, Radio Tags and Transponders, Range Tacking, 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.

MTRX5700
Experimental Robotics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 3 hrs/week; Lecture 2 hrs/week. **Prerequisites:** (AMME3500 OR AMME9501) AND MTRX3700 **Assumed knowledge:** Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed. **Assessment:** Through semester assessment (70%) Final Exam (30%) **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 manufacturing, automobile systems and assembly systems; develop the capacity to think critically 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.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

AMME5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Corequisites:** AMME5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B Extended covers the second of stage writing up and presenting the research results. This extended version of Capstone Project allows the student to investigate a topic of greater depth and scope.

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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

AMME5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace AMME5020, AMME5021 and 12 cp of electives with AMME5222 & AMME5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

AERO5010
Optimisation Methods in Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time 10 hrs/week. **Assumed knowledge:** BE in the area of Aerospace or related Engineering field. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Department Permission required for Enrolment

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.

Note: Department Permission required for enrolment

AERO5200
Advanced Aerodynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** AERO5210 OR AERO9260 OR AERO3260 **Assumed knowledge:** BE in the area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (100%) **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 and aerodynamics. The develop familiarity with the techniques for predicting airflow/structure interactions for aerospace vehicles.

Syllabus Summary:

(a) Advanced two and three dimensional panel method techniques; calculation of oscillatory flow results; prediction of aerodynamic derivatives. Pressure distributions for complete aircraft configuration. Unsteady subsonic flow analysis of aircraft; calculation of structural modes. Structural response to gusts; aeroelasticity; flutter and divergence. Solution of aerospace flow problems using finite element methods.

(b) Unsteady supersonic one-dimensional flow. Hypersonic flow; real gas effects. Introduction to the use of CFD for transonic flow.

(c) Rarefied gas dynamics. Direct simulation method (DSMC); near-continuum solutions. Simulation techniques for numerical solutions of non-linear continuum flow.

AERO9301
Applied Finite Element Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** 2.5 hours of lectures and 2 hours of workgroup session per week **Prerequisites:** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **Prohibitions:** AERO5301 **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (55%), Final Exam (45%) **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.

AERO5400
Advanced Aircraft Design Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Lecture 2 hrs/week; Meeting 2 hrs/week. **Prerequisites:** AERO3460 OR AERO5410 OR AERO9460 **Prohibitions:** : AERO4491 **Assumed knowledge:** (AERO1400, AERO3260, AERO3261, AERO3360, AERO3465, AERO3560, AERO4460) or equivalent. **Assessment:** Through semester assessment (100%) **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.

AERO5500
Flight Mechanics Test and Evaluation Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 3 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** AERO5510 OR AERO9560 OR AERO3560 **Assumed knowledge:** BE in the area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (100%) **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.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 2 hrs/week; Lecture 1 hr/week; Tutorial 1 hr/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. **Assessment:** Through semester assessment (100%) **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/diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 3 hrs/week. **Assumed knowledge:** The students will require 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

AMME5101
Energy and the Environment

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - own time 2 hrs/week. **Prerequisites:** 24 credits of 3000-level or above units of study **Assessment:** Through semester assessment (100%) **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. CO_2 capture and sequestration;
9. Design of various components of thermal power plants.

AMME9961
Biomechanics and Biomaterials

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 3 hours per week **Prohibitions:** AMME5961 **Assumed knowledge:** Chemistry, Biology, Materials Engineering, and Engineering Design at least at the Junior level. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course is divided into two parts: biomechanics and biomaterials:

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.

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 metals, then polymers (thermoplastic, thermosetting, and biodegradable), and finally ceramics (bioinert, biodegradable, and bioactive).

AMME9971
Tissue Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures: 2 hours per week; Tutorials: 2 hours per week **Prohibitions:** AMME5971 **Assumed knowledge:** 6 credit points of junior biology, 6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of junior and intermediate biology and thus students will already have practical hands-on biological training. The purpose of this UoS is to elaborate the theory and latest developments of this very new field of tissue engineering, thereby building on the existing practical and theoretical knowledge base the students have in cell biology.

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:

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.

AMME9981
Computational Biomedical Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorial: 2 hours per week; Lecture: 3 hours per week; Research: 4 hours per week; Meeting: 1 hours per week; **Prohibitions:** AMME5981 **Assumed knowledge:** AMME9301, AMME9302, AMME9500, and MECH9361. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.

This unit of study 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;

AMME9990
Biomedical Engineering Tech 1

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; **Prohibitions:** AMME5990 **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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.

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.

ELEC5303
Computer Control System Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **Assessment:** Through semester assessment (44%) Final Exam (56%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

MECH5255
Air Conditioning and Refrigeration (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prerequisites:** MECH3260 **Prohibitions:** MECH4255 **Assumed knowledge:** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

MECH5265
Advanced Combustion

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prerequisites:** (MECH3260 AND MECH3261) OR MECH5262 OR MECH9260 **Assumed knowledge:** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

MECH5275
Advanced Renewable Energy

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) **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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

MECH5305
Smart Materials

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 3 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The UoS covers the key knowledge of most smart materials such as dielectric, piezoelectric, magneto-electric and shape memory materials. Each student participates in a couple of group projects relevant to characterization of structure-property relationship of functional structures with desired performance. Under the guidance of the supervisor, the student will learn how to develop a proposal, how to do the project investigation and how to prepare and carry out the technical communications (writing and oral). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.

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:** Lecture 2 hrs/week; Tutorial 3 hrs/week; Laboratory 3 hrs. **Prohibitions:** MECH4310 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.

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.

For more information on units of study visit CUSP.

Biomedical Engineering

Course overview

A postgraduate major in Biomedical Engineering will allow you to apply engineering principles in order to understand, modify or control biological systems.

You will learn how to develop technology to monitor physiological functions and to assist in diagnosis and treatment of patients.

Areas of study include biomaterials engineering, applied tissue engineering, advanced engineering materials and computational fluid dynamics.

Course requirements

To meet requirements for the Master of Engineering majoring in Biomedical Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of cpecialist units
- A minimum of 12 credit points of research units
- A maximum of 12 credit points of elective units.

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL) need to complete 48 credit points of Core/Specialist/Research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit our course and unit of study portal CUSP http://cusp.sydney.edu.au.

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Biomedical Engineering			
To meet requirements for the Master of Engineering majoring in Biomedical Engineering a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
AMME5921 **Biomedical Engineering Tech 2**	6	**A** This is an introductory Masters of Engineering unit. A bachelors degree, ideally in the engineering or science field, is advisory, but not essential.	Semester 2
AMME9961 **Biomechanics and Biomaterials**	6	**A** Chemistry, Biology, Materials Engineering, and Engineering Design at least at the Junior level. **N** AMME5961	Semester 2
AMME9971 **Tissue Engineering**	6	**A** 6 credit points of junior biology, 6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent. **N** AMME5971 *The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of junior and intermediate biology and thus students will already have practical hands-on biological training. The purpose of this UoS is to elaborate the theory and latest developments of this very new field of tissue engineering, thereby building on the existing practical and theoretical knowledge base the students have in cell biology.*	Semester 1
AMME9981 **Computational Biomedical Engineering**	6	**A** AMME9301, AMME9302, AMME9500, and MECH9361. **N** AMME5981 *The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.*	Semester 1
AMME9990 **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. **N** AMME5990 *The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.*	Semester 1
CHNG5602 **Cellular Biophysics**	6	*Note: Department permission required for enrolment*	Semester 1
Research units			
All candidates are required to complete a minimum of 12 credit points from the following units:			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study).	Semester 1 Semester 2
AMME5021 **Capstone Project B**	6	**C** AMME5020	Semester 1 Semester 2
AMME5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2
AMME5222 **Dissertation A**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2
AMME5223 **Dissertation B**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2

With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace AMME5020, AMME5021 and 12 cp of electives with AMME5222 & AMME5223, Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:

Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.

Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field. *Note: Department permission required for enrolment* *Department Permission required for Enrolment*	Semester 2
AERO9301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field. **P** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **N** AERO5301	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** The students will require 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. *Note: Department permission required for enrolment*	Semester 2
AMME5310 **Engineering Tribology**	6	**A** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261)	Semester 1
AMME5520 **Advanced Control and Optimisation**	6	**A** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **P** AMME3500 OR AMME5501 OR AMME9501	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. *Note: Department permission required for enrolment*	Semester 2
AMME5902 **Advanced Computer Aided Manufacturing**	6		Semester 2
AMME5912 **Crash Analysis and Design**	6	**A** Computer Aided Drafting, Basic FEA principles and Solid Mechanics	Semester 1
AMME5951 **Fundamentals of Neuromodulation**	6	**A** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent.	Semester 1
CHNG5601 **Membrane Science**	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 *This course is for Master degree students and also is offered as an elective course for fourth year students. Some lectures my be given by a guest lecturer. this*	Semester 1
CHNG5605 **Bio-Products: Laboratory to Marketplace**	6	*This course is for Master degree students and also is offered as an elective course for fourth year students. .*	Semester 2
ELEC5803 **Advanced Bioelectronics**	6	**A** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **P** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) *Note: Department permission required for enrolment*	Semester 1
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310 *Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.*	Semester 1
MECH5416 **Advanced Design and Analysis**	6	**A** 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	Semester 1
MECH5720 **Sensors and Signals**	6	**A** Strong MATLAB skills **N** MECH4720	Semester 2
MTRX5700 **Experimental Robotics**	6	**A** Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed. **P** (AMME3500 OR AMME9501) AND MTRX3700	Semester 1

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Biomedical Engineering

To meet requirements for the Master of Engineering majoring in Biomedical Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

AMME5921
Biomedical Engineering Tech 2

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 4 hrs/week. **Assumed knowledge:** This is an introductory Masters of Engineering unit. A bachelors degree, ideally in the engineering or science field, is advisory, but not essential. **Assessment:** Through semester assessment (100%) **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.

AMME9961
Biomechanics and Biomaterials

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 3 hours per week **Prohibitions:** AMME5961 **Assumed knowledge:** Chemistry, Biology, Materials Engineering, and Engineering Design at least at the Junior level. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course is divided into two parts: biomechanics and biomaterials:

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.

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 metals, then polymers (thermoplastic, thermosetting, and biodegradable), and finally ceramics (bioinert, biodegradable, and bioactive).

AMME9971
Tissue Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures: 2 hours per week; Tutorials: 2 hours per week **Prohibitions:** AMME5971 **Assumed knowledge:** 6 credit points of junior biology, 6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of junior and intermediate biology and thus students will already have practical hands-on biological training. The purpose of this UoS is to elaborate the theory and latest developments of this very new field of tissue engineering, thereby building on the existing practical and theoretical knowledge base the students have in cell biology.

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:

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.

AMME9981
Computational Biomedical Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorial: 2 hours per week; Lecture: 3 hours per week; Research: 4 hours per week; Meeting: 1 hours per week; **Prohibitions:** AMME5981 **Assumed knowledge:** AMME9301, AMME9302, AMME9500, and MECH9361. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.

This unit of study 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;

AMME9990
Biomedical Engineering Tech 1

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; **Prohibitions:** AMME5990 **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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.

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.

CHNG5602
Cellular Biophysics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 4 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

AMME5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Corequisites:** AMME5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B Extended covers the second of stage writing up and presenting the research results. This extended version of Capstone Project allows the student to investigate a topic of greater depth and scope.

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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

AMME5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace AMME5020, AMME5021 and 12 cp of electives with AMME5222 & AMME5223, Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

AERO5010
Optimisation Methods in Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time 10 hrs/week. **Assumed knowledge:** BE in the area of Aerospace or related Engineering field. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Department Permission required for Enrolment

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.

Note: Department Permission required for enrolment

AERO9301
Applied Finite Element Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** 2.5 hours of lectures and 2 hours of workgroup session per week **Prerequisites:** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **Prohibitions:** AERO5301 **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (55%), Final Exam (45%) **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.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 2 hrs/week; Lecture 1 hr/week; Tutorial 1 hr/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. **Assessment:** Through semester assessment (100%) **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/diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 3 hrs/week. **Assumed knowledge:** The students will require 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

AMME5310
Engineering Tribology

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs; Tutorial 3 hrs/week; Seminar 3 hrs/week. **Assumed knowledge:** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim is to teach students in the undergraduate and postgraduate levels basic concepts about friction, lubrication and wear applicable to design and operation of mechanical systems used in engineering, industrial, and modern applications. Examples of these systems are lubrication of internal combustion engines, gearboxes, artificial hip/knee joints, and micro/nano electromechanical systems.

AMME5520
Advanced Control and Optimisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Research 1 hr/week. **Prerequisites:** AMME3500 OR AMME5501 OR AMME9501 **Assumed knowledge:** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces engineering design via optimization, i.e. finding the "best possible" solution to a particular problem. For example, an autonomous vehicle must find the fastest route between two locations over a road network; a biomedical sensing device must compute the most accurate estimate of important physiological parameters from noise-corrupted measurements; a feedback control system must stabilize and control a multivariable dynamical system (such as an aircraft) in an optimal fashion.

The student will learn how to formulate a design in terms of a "cost function", when it is possible to find the "best" design via minimization of this "cost", and how to do so. The course will introduce widely-used optimization frameworks including linear and quadratic programming (LP and QP), dynamic programming (DP), path planning with Dijkstra's algorithm, A*, and probabilistic roadmaps (PRMs), state estimation via Kalman filters, and control via the linear quadratic regulator (LQR) and Model Predictive Control (MPC). There will be constant emphasis on connections to real-world engineering problems in control, robotics, aerospace, biomedical engineering, and manufacturing.

AMME5602
Product Life Cycle Design

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 5 hrs/week. **Assumed knowledge:** Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This subject covers 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.

AMME5902
Advanced Computer Aided Manufacturing

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class, Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory, Seminar, **Assessment:** Through semester assessment (100%) **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

oHow to successfully complete a CAD/CAM and CNC mill based project.

oManufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;

oThe science in designing and selecting a manufacturing method.

oHow to effectively present your ideas and outcomes using oral and report based methods.

It is expected that through your hard work in the semester, you will find

oEnhanced learning by real-world problems.

oImproved comprehensive skill in manufacturing design.

AMME5912
Crash Analysis and Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - own time, **Assumed knowledge:** Computer Aided Drafting, Basic FEA principles and Solid Mechanics **Assessment:** Through semester assessment (100%) **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-PreSys, 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.

AMME5951
Fundamentals of Neuromodulation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Implantable microelectronic devices functioning either as nerve stimulators or nerve blockers comprise one of the largest markets in the global medical device industry. The aim of this unit of study is to give students a complete overview of the underlying technology (microelectronics, encapsulation biomaterials, electrode biomaterials, electrode-neural interactions, inductive power systems and data links, signal processing) and an expert review of the major technological applications on the market, which include Cochlear implants, pacemakers and implantable defibrillators, deep brain stimulators, pain control nerve blockers, bionic eye implants, functional electrical stimulation systems. The unit will also review emerging applications such as gastrointestinal disorders, obesity; vagal nerve stimulation - epilepsy, depression, carotid artery stimulation - hypertension, spinal cord stimulation - ischemic disorders, angina, peripheral vascular disease, incontinence, erectile dysfunction. The unit will conclude with a snapshot of the future: "brain on a chip" progress, nerve regrowth, neurotropins, drug/device combinations. This is a Master of Professional Engineering Unit of Study intended for biomedical engineering students with an interest in working in the medical device industry in the large market sector area of implantable electronic devices.

CHNG5601
Membrane Science

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 4 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

"Membrane Science" provides background in the physics and electrochemistry of a variety of synthetic membranes used in industry as well as cellular membranes.

The course aims to provide students with an understand of:

membrane self-assembly and manufacture;

membrane separation processes such as filtration, desalination, ion exchange and water-splitting;

and techniques for membrane characterisation and monitoring.

CHNG5603
Analysis, Modelling, Control: BioPhy Sys

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Project Work - own time 2 hrs/week. **Assumed knowledge:** It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This course is for Master degree students and also is offered as an elective course for fourth year students. Some lectures my be given by a guest lecturer. this

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.

CHNG5605
Bio-Products: Laboratory to Marketplace

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Project Work - own time 6 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This course is for Master degree students and also is offered as an elective course for fourth year students. .

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.This unit of study is offered as an advanced elective unit of study to final year undergraduate students. Students may be required to attend lectures off-campus.

ELEC5803
Advanced Bioelectronics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) **Assumed knowledge:** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will cover advanced topics in the application of electronics and signal processing to physiological monitoring, biosensors, electrical stimulation and medical imaging. Electrical safety and regulations of medical devices in Australia will be introduced. Guest lectures will describe the different needs and requirements in several clinical areas including neonatal care, oncology, cardiology and neurology.

Assumed Knowledge: A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

MECH5310
Advanced Engineering Materials

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 3 hrs/week; Laboratory 3 hrs. **Prohibitions:** MECH4310 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.

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.

MECH5416
Advanced Design and Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

1. 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.

2. 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.

3. 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.

MECH5720
Sensors and Signals

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 3 hrs/week; Project Work - own time 2 hrs/week; Presentation 2 hrs; Laboratory 2 hrs; Tutorial 2 hrs/week. **Prohibitions:** MECH4720 **Assumed knowledge:** Strong MATLAB skills **Assessment:** Through semester assessment (75%) Final Exam (25%) **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: Convolution, The Fourier Transform, Modulation (FM, AM, FSK, PSK etc), Frequency shifting (mixing)

b) PASSIVE SENSORS: Infrared Radiometers, Imaging Infrared, Passive Microwave Imaging, Visible Imaging & Image Intensifiers

c) ACTIVE SENSORS THE BASICS: Operational Principles, Time of flight (TOF) Measurement & Imaging of Radar, Lidar and Sonar, Radio Tags and Transponders, Range Tacking, 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.

MTRX5700
Experimental Robotics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 3 hrs/week; Lecture 2 hrs/week. **Prerequisites:** (AMME3500 OR AMME9501) AND MTRX3700 **Assumed knowledge:** Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed. **Assessment:** Through semester assessment (70%) Final Exam (30%) **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 manufacturing, automobile systems and assembly systems; develop the capacity to think critically 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.

For more information on units of study visit CUSP.

Chemical and Biomolecular Engineering

Course overview

A postgraduate major in Chemical and Biomolecular Engineering is concerned with industrial processes, in which material in bulk undergoes changes in its physical or chemical nature.

Chemical and biomolecular engineers design, construct, operate and manage these processes and in this they are guided by economic, environmental and societal considerations.

Areas of study include process system engineering, biophysical systems and membrane science.

Course requirements

To meet requirements for the Master of Engineering majoring in Chemical and Biomolecular Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- A minimum of 12 credit points of research units
- A maximum of 12 credit points of elective units

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL) need to complete 48 credit points of core/specialist/research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit our course and unit of study portal CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Chemical and Biomolecular Engineering			
To meet requirements for the Master of Engineering majoring in Chemical and Biomolecular Engineering a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
CHNG5001 **Process Systems Engineering**	6	**A** First year undergraduate physics and mathematics (differential equations). Use of mathematical and/or computer-based modelling tools and techniques. Feedback control concepts and principles as taught in CHNG3802/CHNG5802 or similar courses. Students who are unsure about meeting these requirements should contact the unit coordinator for advice. *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** CHNG3801 AND CHNG3802 AND CHNG3803 AND CHNG3805 AND CHNG3806 AND CHNG3807. All core third year chemical engineering.	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. *Note: Department permission required for enrolment*	Semester 1
CHNG5005 **Wastewater Engineering**	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 1
CHNG5006 **Advanced Wastewater Engineering**	6	**A** CHNG5005 OR CHNG3804.	Semester 2
CHNG5008 **Nanotechnology in Chemical Engineering**	6	**P** CHNG3801 AND CHNG3802 AND CHNG3805 AND CHNG3806 *Note: Department permission required for enrolment* *Note: School permission required for enrollment.*	Semester 2
CHNG5601 **Membrane Science**	6		Semester 1
CHNG5602 **Cellular Biophysics**	6	*Note: Department permission required for enrolment*	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 *This course is for Master degree students and also is offered as an elective course for fourth year students. Some lectures my be given by a guest lecturer. this*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHNG5604 **Membrane Engineering Laboratory**	6	**A** CHNG5601	Semester 2
CHNG5605 **Bio-Products: Laboratory to Marketplace**	6	*This course is for Master degree students and also is offered as an elective course for fourth year students. .*	Semester 2
Research units			
All candidates are required to complete a minimum of 12 credit points from the following units:			
CHNG5020 **Capstone Project A**	6	**A** (CHNG9301 OR CHNG5801) AND (CHNG9302 OR CHNG5802) AND (CHNG9303 OR CHNG5803) AND (CHNG9305 OR CHNG5805) AND (CHNG9306 OR CHNG5806). **P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) *School permission required for enrolment in semester 2.*	Semester 1 Semester 2
CHNG5021 **Capstone Project B**	6	**A** Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. **C** CHNG5020 *School permission required for enrolment in session 1.*	Semester 1 Semester 2
CHNG5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **C** CHNG5020 *Note: Department permission required for enrolment* *Permission required for semester 1 or 2 based on achievement in Capstone Project A and taking other program requirements into consideration.*	Semester 1 Semester 2
CHNG5222 **Dissertation A**	12	**N** ENGG5221, ENGG5220 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
CHNG5223 **Dissertation B**	12	**N** ENGG5221, ENGG5220 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace AMME5020, AMME5021 and 12 cp of electives with AMME5222 & AMME5223, Dissertation A & B.			
Elective units			
Candidates may complete a maximum of 12 credit points from the following units: Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director. Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.			
CIVL5670 **Reservoir Stream & Coastal Eng**	6	**A** CIVL3612 and MATH2061.	Semester 1
ENGG5216 **Management of Engineering Innovation**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 1
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July
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. **P** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) *Note: Department permission required for enrolment*	Semester 2

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Chemical and Biomolecular Engineering

To meet requirements for the Master of Engineering majoring in Chemical and Biomolecular Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

CHNG5001
Process Systems Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Project Work - in class 2 hrs/week; Project Work - own time 4 hrs/week. **Assumed knowledge:** First year undergraduate physics and mathematics (differential equations). Use of mathematical and/or computer-based modelling tools and techniques. Feedback control concepts and principles as taught in CHNG3802/CHNG5802 or similar courses. Students who are unsure about meeting these requirements should contact the unit coordinator for advice. **Assessment:** Through semester assessment (100%) **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:** Meeting 4 hrs/week. **Assumed knowledge:** CHNG3801 AND CHNG3802 AND CHNG3803 AND CHNG3805 AND CHNG3806 AND CHNG3807. All core third year chemical engineering. **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/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. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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. This UoS is an advanced Chemical Engineering elective.

CHNG5005
Wastewater Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Group assignment 2 hrs/week; Site Visit 5 hrs/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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to acquaint students with the application of chemical engineering concepts and practice in an environmental context, the important example of wastewater treatment will be explored.

The key issues that will be considered are: Wastewater creation and characterisation; Wastewater treatment costs; Primary, secondary and tertiary treatment options; High-rate anaerobic and aerobic treatment options; Sludge management and water recovery/reuse options; Process integration considerations.

By the end of this UOS, a student should have gained an engineering-based appreciation of the technical, economic and social challenges posed by wastewater generation and its cost-effective treatment.

This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught here are relevant to the real-world practice of chemical engineering across a broad range of industries.

CHNG5006
Advanced Wastewater Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** CHNG5005 OR CHNG3804. **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study addresses inter-related issues relevant to wastewater treatment including: (i) the diverse nature of wastewater and its characteristics; (ii) an overview of conventional wastewater treatment options; (iii) the use of commercial software in designing and evaluating a range of advanced wastewater treatment options including biological nutrient removal; (iv) the potential role of constructed wetlands in domestic and industrial wastewater treatment; (v) wastewater management in the food processing, resources, and coal seam gas production industries; (vi) researching advanced wastewater treatment options.

CHNG5008
Nanotechnology in Chemical Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time 8 hrs/week; Lecture 4 hrs/week. **Prerequisites:** CHNG3801 AND CHNG3802 AND CHNG3805 AND CHNG3806 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Note: School permission required for enrollment.

This course will give students insights into advanced concepts in Chemical and Biomolecular Engineering, which are essential for the design of efficient processes and green products for the sustainable development and minimise or preferably eliminate waste for a clean world. This unit of study will examine cutting edge examples of nano-technology, renewable energy, bio-technology, and other advanced technologies across a broad range of applications relevant to chemical and biomolecular engineering. At the completion of this unit of study students should have developed an appreciation of the underlying concepts 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.

CHNG5601
Membrane Science

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 4 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

"Membrane Science" provides background in the physics and electrochemistry of a variety of synthetic membranes used in industry as well as cellular membranes.

The course aims to provide students with an understand of:

membrane self-assembly and manufacture;

membrane separation processes such as filtration, desalination, ion exchange and water-splitting;

and techniques for membrane characterisation and monitoring.

CHNG5602
Cellular Biophysics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 4 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Project Work - own time 2 hrs/week. **Assumed knowledge:** It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This course is for Master degree students and also is offered as an elective course for fourth year students. Some lectures my be given by a guest lecturer. this

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 Engineering Laboratory

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 4 hrs/week. **Assumed knowledge:** CHNG5601 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This a practical unit of study where students apply the theoretical concepts of membrane science to engineering practice via a series of laboratory experiments. The students will gain practical insights into mass transport processes through various membranes. Students will understand the construction and functional properties of synthetic separation membranes and also will explore experimentally the various factors affecting the performance of membranes.

CHNG5605
Bio-Products: Laboratory to Marketplace

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Project Work - own time 6 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This course is for Master degree students and also is offered as an elective course for fourth year students. .

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.This unit of study is offered as an advanced elective unit of study to final year undergraduate students. Students may be required to attend lectures off-campus.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

CHNG5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting 1 hr/week; Project Work - own time 5 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assumed knowledge:** (CHNG9301 OR CHNG5801) AND (CHNG9302 OR CHNG5802) AND (CHNG9303 OR CHNG5803) AND (CHNG9305 OR CHNG5805) AND (CHNG9306 OR CHNG5806). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: School permission required for enrolment in semester 2.

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 (Minimum 12 A and B) run over two semesters. 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.Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.

CHNG5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting 1 hr/week; Project Work - own time 5 hrs/week. **Corequisites:** CHNG5020 **Assumed knowledge:** Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: School permission required for enrolment in session 1.

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 (Capstone Project 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. The supervisor will be available for discussion - typically 1 hour per week.

CHNG5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** No formal classes **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Corequisites:** CHNG5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: Permission required for semester 1 or 2 based on achievement in Capstone Project A and taking other program requirements into consideration.

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 (Capstone Project A and B/B extended) 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 Capstone Project A will be evaluated based on a seminar presentation and a progress report. The skills acquired will be invaluable to students undertaking engineering work.Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week. Capstone Project B extended enables the student to undertake a project of greater scope and depth than capstone project B.

CHNG5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5221, ENGG5220 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 &2

CHNG5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5221, ENGG5220 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 insessions 1 & 2

With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace AMME5020, AMME5021 and 12 cp of electives with AMME5222 & AMME5223, Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

CIVL5670
Reservoir Stream & Coastal Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs/week; Tutorials 2 hrs/week. **Assumed knowledge:** CIVL3612 and MATH2061. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

(Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)

ENGG5216
Management of Engineering Innovation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Presentation 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

MECH5275
Advanced Renewable Energy

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) **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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

For more information on units of study visit CUSP.

Civil Engineering

Course overview

A postgraduate major in Civil Engineering covers planning, designing and testing structures within the built environment.

It is concerned with all types of infrastructures including dams, bridges, pipelines, roads, towers and buildings.

Areas of study include steel/concrete structures, environmental geotechnics, advanced water resources management and numerical methods in engineering.

Course requirements

To meet requirements for the Master of Engineering majoring in Civil Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- A minimum of 12 credit points of research units
- A maximum of 12 credit points of elective units

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points of core/specialist/research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Civil Engineering			
To meet requirements for the Master of Engineering majoring in Civil Engineering a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
CHNG5005 **Wastewater Engineering**	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 1
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	**A** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis.	Semester 2
CIVL5450 **Analysis and Design of Pile Foundations**	6		Semester 1
CIVL5451 **Computer Methods in Geotechnical Eng** *This unit of study is not available in 2015*	6		Semester 1
CIVL5453 **Geotechnical Hazards**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity).	Semester 2
CIVL5454 **Rock Engineering**	6	**A** Undergraduate geology and soil mechanics	Semester 2
CIVL5455 **Engineering Behaviour of Soils**	6	**A** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential.	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5666 **Open Channel Flow & Hydraulic Structures**	6	**A** Advanced knowledge of fluid mechanics is necessary for this UoS.	Semester 1
CIVL5668 **Wind Engineering for Design-Fundamentals**	6		Semester 1
CIVL5669 **Applied Fluid Engineering Computing**	6	**A** CIVL5511 or CIVL9612. 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

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2
CIVL5222 **Dissertation A**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
CIVL5223 **Dissertation B**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

With permission from the Program Director candidates progressing with distinction (75%) average or higher results may replace CIVL5020, CIVL52021 and 12 cp of electives with CIVL5222 & CIVL5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:

Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.

Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
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
CHNG5006 **Advanced Wastewater Engineering**	6	**A** CHNG5005 OR CHNG3804.	Semester 2
CIVL5266 **Steel Structures - Stability**	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis.	Semester 1
CIVL5269 **Concrete Structures - Strength & Service**	6	**P** CIVL3205 OR CIVL5507 OR CIVL9205	Semester 2
CIVL5351 **Geoenvironmental Engineering**	6		Semester 1
CIVL5452 **Foundation Engineering**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity)	Semester 1
CIVL5458 **Numerical Methods in Civil Engineering**	6		Semester 1
CIVL5665 **Advanced Water Resources Management**	6	**A** CIVL3612	Semester 2
CIVL5670 **Reservoir Stream & Coastal Eng**	6	**A** CIVL3612 and MATH2061.	Semester 1
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Civil Engineering

To meet requirements for the Master of Engineering majoring in Civil Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

CHNG5005
Wastewater Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Group assignment 2 hrs/week; Site Visit 5 hrs/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.

Assessment: Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to acquaint students with the application of chemical engineering concepts and practice in an environmental context, the important example of wastewater treatment will be explored.

The key issues that will be considered are: Wastewater creation and characterisation; Wastewater treatment costs; Primary, secondary and tertiary treatment options; High-rate anaerobic and aerobic treatment options; Sludge management and water recovery/reuse options; Process integration considerations.

By the end of this UOS, a student should have gained an engineering-based appreciation of the technical, economic and social challenges posed by wastewater generation and its cost-effective treatment.

This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught here are relevant to the real-world practice of chemical engineering across a broad range of industries.

CIVL5257
Concrete Structures: Prestressed

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - in class 1 hr/week; Project Work - own time 3 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

CIVL5264
Composite Steel-Concrete Structures

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students will understand the basic principles for the design of composite steel-concrete structures. In particular, they will develop an understanding of the procedures required for the design of composite beams, slabs and columns. Design guidelines will reflect requirements of the Australian Standards and international codes.

CIVL5267
Steel Structures - Advanced Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 as well as international standards, 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, AS/NZS4600, AISC-LRFD, BS5950 and GB50017 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.

CIVL5268
Structural Dynamics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis. **Assessment:** Through semester assessment (65%) Final Exam (35%) **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 (SDOF) 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 Parts4 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

* Ability to apply AS1170 Part 4 in structural design against earthquake actions

* Understanding of the fundamental concepts of earthquake engineering

CIVL5450
Analysis and Design of Pile Foundations

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week; Project Work - own time 6 hrs/week; Laboratory 3 hrs/week. **Assessment:** Through semester assessment (100%) **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.

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

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (100%) **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.

CIVL5453
Geotechnical Hazards

Credit points: 6 **Teacher/Coordinator:** Pierre Rognon **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 1 hour per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity). **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Geotechnical flows include landslides, rock falls and mud flows. They are triggered by soil failure due to natural or human causes. The objective of this Unit of Study is to develop the ability to assess and mitigate the risks associated to such events. Students will learn how to estimate when and where these events are likely to occur, how to define safety zones and how to design effective protection structures. The syllabus is comprised of (i) Landslide Risk Assessment and Management procedures (ii) post-faillure and out of equilibrium soil mechanics applied to prediction of rock fall, landslide and mud flow run-out distance and impact force on structures; (iii) design of geotechnical protection structures.

CIVL5454
Rock Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Laboratory 3 hrs/week. **Assumed knowledge:** Undergraduate geology and soil mechanics **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives: to develop an understanding of the behaviour and design of engineering structures in rock masses

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.

CIVL5455
Engineering Behaviour of Soils

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential. **Assessment:** Through semester assessment (100%) **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.

CIVL5666
Open Channel Flow & Hydraulic Structures

Credit points: 6 **Session:** Semester 1 **Assumed knowledge:** Advanced knowledge of fluid mechanics is necessary for this UoS. **Assessment:** Through semester assessment (100%) **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.

CIVL5668
Wind Engineering for Design-Fundamentals

Credit points: 6 **Session:** Semester 1 **Assessment:** Through semester assessment (60%) Final Exam (40%) **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, dynamic response of structures, and how all the above relates to AS1170.2.

CIVL5669
Applied Fluid Engineering Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **Assumed knowledge:** CIVL5511 or CIVL9612. 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit is to provide students with advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving thermal fluid 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.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

Capstone Project 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 Capstone Project course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021) or this unit Capstone Project B extended (CIVL5022) worth 12 credit points. This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

CIVL5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

With permission from the Program Director candidates progressing with distinction (75%) average or higher results may replace CIVL5020, CIVL52021 and 12 cp of electives with CIVL5222 & CIVL5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 2 hrs/week; Lecture 1 hr/week; Tutorial 1 hr/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. **Assessment:** Through semester assessment (100%) **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/diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

CHNG5006
Advanced Wastewater Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** CHNG5005 OR CHNG3804. **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study addresses inter-related issues relevant to wastewater treatment including: (i) the diverse nature of wastewater and its characteristics; (ii) an overview of conventional wastewater treatment options; (iii) the use of commercial software in designing and evaluating a range of advanced wastewater treatment options including biological nutrient removal; (iv) the potential role of constructed wetlands in domestic and industrial wastewater treatment; (v) wastewater management in the food processing, resources, and coal seam gas production industries; (vi) researching advanced wastewater treatment options.

CIVL5266
Steel Structures - Stability

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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.

CIVL5269
Concrete Structures - Strength & Service

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** CIVL3205 OR CIVL5507 OR CIVL9205 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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). Strut-and-tie modelling of reinforced concrete members is also described. Design guidelines will reflect requirements of the Australian Standards and Eurocodes.

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;

- ability to use strut-and-tie models of reinforced concrete behaviour.

CIVL5351
Geoenvironmental Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **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.

Learning Outcomes: 1. Analyse flow regime in soil using Darcy equation; 2. Analyse contaminant migration in soil using coupled flow and reactive diffusion advection equations; 3. Design a single or double composite landfill liner satisfying groundwater quality requirements; 4. Predict the potential for methane production in a landfill and assess the feasibility of waste-to-energy conversion; 5. Conduct research on a geoenvironmental topic as part for group.

Syllabus Summary: introduction to geoenvironmental engineering; integrated waste management and life cycle assessment; soil composition and mineralogy; types and characteristics of contaminants; theory of water seepage in soil and hydraulic conductivity; theory of reactive contaminant transport in soil including molecular diffusion, mechanical dispersion and advective flow; analytical and numerical solutions of reactive diffusion advection equation; design of landfills; geosynthetics and geomembranes; defects and leakage rates; methane generation in landfills and landfill gas management.

CIVL5452
Foundation Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 3 hrs per week, presented in 2 sessions per week for 11 weeks of semester. Tutorials 1hr per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity) **Assessment:** Through semester assessment (100%) **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.

CIVL5458
Numerical Methods in Civil Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives:

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.

CIVL5665
Advanced Water Resources Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL3612 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit of study is to introduce students and professionals to water resources engineering. The aim of this unit is to provide an understanding of: hydrologic cycle from the broadest perspective, physical, chemical and biological characterization of water, how to change the water quality parameters, water quality control and management, water quality in the environment, nutrient and contaminant cycling and removal, water treatment methods for drinking, wastewater and groundwater, conservation/reuse/treatment techniques, desalination, stormwater, bioremediation and phytoremediation techniques. The topics mentioned above will be covered in both a qualitative and quantitative aspects. A basic level of integral and differential calculus is required as well as knowledge and use of calculation software such as Excell and Matlab.

CIVL5670
Reservoir Stream & Coastal Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs/week; Tutorials 2 hrs/week. **Assumed knowledge:** CIVL3612 and MATH2061. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

(Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Electrical Engineering

Course overview

A postgraduate major in Electrical Engineering is concerned with the way electrical energy is produced and used in homes, the community and industry.

It will provide you with advanced knowledge in designing and building systems and machines that generate, transmit, measure, control and use electrical energy essential to modern life.

Areas of study include wireless engineering, power engineering, high-voltage engineering and digital integrated circuit design.

Course requirements

To meet requirements for the Master of Engineering majoring in Electrical Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- A minimum of 12 credit points of research units
- A maximum of 12 credit points of elective units

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points of core/specialist/research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Electrical Engineering			
To meet requirements for the Master of Engineering majoring in Electrical Engineering a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
ELEC5101 **Antennas and Propagation**	6		Semester 2
ELEC5203 **Topics in Power Engineering**	6	**A** ELEC3203 Power Engineering and ELEC3204 Power Electronics and Drives.Familiarity with basic mathematics and physics; competence with basic circuit theory and understanding of electricity grid equipment such as transformers, transmission lines and associated modeling; and fundamentals of power electronic technologies.	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.	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. **P** ELEC3203 OR ELEC9203	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
ELEC5207 **Advanced Power Conversion Technologies**	6	**A** ELEC3204	Semester 2
ELEC5208 **Intelligent Electricity Networks**	6	**A** Fundamentals of Electricity Networks, Control Systems and Telecommunications	Semester 1
ELEC5211 **Power Systems Dynamics and Control**	6	**A** The pre-required knowledge for learning this UoS is a deep understanding on circuit analysis and its applications in power system steady state analysis. **P** ELEC3203 OR ELEC9203 OR ELEC5732	Semester 1
ELEC5212 **Power Systems Planning and Markets**	6	**A** The pre-required knowledge for learning this UoS is power system steady state analysis **P** ELEC3203 OR ELEC9203	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. *Note: Department permission required for enrolment*	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.	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5507 **Error Control Coding**	6	**A** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired.	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
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.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	Semester 2
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3305, ELEC3506, ELEC3607 and ELEC5508	Semester 2
ELEC5516 **Electrical and Optical Sensor Design**	6	**A** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis	Semester 1
ELEC5701 **Technology Venture Creation**	6	**N** ENGG5102	Semester 2

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
ELEC5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC5222 **Dissertation A**	12	**N** ENGG5222, ELEC8902, ENGG5223, ELEC8901 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
ELEC5223 **Dissertation B**	12	**N** ELEC8901, ELEC8902, ENGG5223, ENGG5222 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

With permission from the Head of Department candidates progressing with distinction (75%) average or higher results may replace ELEC5020, ELEC2021 and 12 cp of electives with ELEC5222 & ELEC5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:

Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.

Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	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) **N** MECH5701	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5803 **Advanced Bioelectronics**	6	**A** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **P** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) *Note: Department permission required for enrolment*	Semester 1
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Electrical Engineering

To meet requirements for the Master of Engineering majoring in Electrical Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

ELEC5101
Antennas and Propagation

Credit points: 6 **Session:** Semester 2 **Classes:** Laboratory 3 hrs/week; Lecture 2 hrs/week; Independent Study, **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The basics of antenna radiation are introduced with emphasis on the important performance characteristics of the radiation field pattern (in 3 dimensions) and feed impedance. The omnidirectional and Hertzian dipole antennas (both hypothetical in practise but robust theoretically) provide the starting point to analyse real antenna operation. Mutual coupling between close antennas and important 'ground' imaging effects lead to the design of antenna arrays to increase gain and directivity. Aperture antennas and frequency broadbanding techniques are introduced. Ionospheric propagation is discussed and also the the reception efficiency of receiving antennas which allows consideration of a Transmitter - Receiver 'Link budget'. The important 'Pocklington' equation for a wire dipole is developed from Maxwell's equations and leads to the numerical analysis of wire antennas using 'Moment' methods. Real world applications are emphasised throughout and are reinforced by the hands on laboratory program which includes design projects.

ELEC5203
Topics in Power Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial-Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3203 Power Engineering and ELEC3204 Power Electronics and Drives.Familiarity with basic mathematics and physics; competence with basic circuit theory and understanding of electricity grid equipment such as transformers, transmission lines and associated modeling; and fundamentals of power electronic technologies. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides the basis for the analysis of electricity grids using symmetrical components theory. Such analysis theory is the basis for the understanding of electrical faults and the design of protection strategies to safeguard the electrical equipment, and maintain safety of the plant at the highest possible level.

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:** Lecture 2 hrs/week; Tutorial - Laboratory 2 hrs/week; Project Work - in class 2 hrs. **Prerequisites:** ELEC3203 OR ELEC9203 **Assumed knowledge:** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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:** Lecture 2 hrs/week; Tutorial 2 hrs/fortnight; Laboratory 2 hrsfortnight; Project Work - own time 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 power system both at distribution and transmission levels. 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 intelligent electricity networks and advanced energy conversion and power systems. The following topics are covered: modern power systems; distributed generation; co-generation; tri-generation; microturbines; fuel cells; renewable energy sources: solar, wind, hydro, biomass, wind turbines; photovoltaic; grid-connected power systems; stand-alone power systems.

ELEC5207
Advanced Power Conversion Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial - Laboratory 3 hrs/week; Project Work - own time 2 hrs/week. **Assumed knowledge:** ELEC3204 **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to cover advanced topics in power electronics and it applications. In particular, the power electronics interface design and implementation for microgrid, smart grids and modern power systems which have received tremendous attention in recent years. Many countries including Australia are developing different power electronics technologies such as integrating renewable energy sources into the grid, managing charging and discharging of high power energy storage system, controlling the reactive power of power electronics interfaces for grid stability, and adding communication capability to power electronics interfaces for smart meter implementation. The unit assumes prior fundamental knowledge of power electronics systems and applications, including the ability to analyse basic power converters for all four conversions (ac-ac, ac-dc, dc-ac, and ac-dc), and design and implement various applications, such as motor drive and battery charger, with the consideration of electrical characteristics of semiconductors and passive elements. This unit will cover advanced technologies on power electronics interfaces for smart grids and microgrid implementation, which include dynamic voltage restorer, active power filter, reactive power compensation, energy storage management, hybrid energy sources optimisation, multilevel inverter and control, D-STATCOM, etc. To analyse these advanced power conversion systems, some analytical techniques will be introduced. This includes resonant converters, soft-switching technique, ac equivalent circuit modeling, converter control and input/output filter design.

ELEC5208
Intelligent Electricity Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs/. **Assumed knowledge:** Fundamentals of Electricity Networks, Control Systems and Telecommunications **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to give students an introduction to the planning and operation of modern electricity grids, also known as "smart" grids. Traditional power networks featured a small number of large base-load plants sending power out over transmission lines to be distributed in radial lower voltage networks to loads. In response to the need to reduce carbon impact, future networks will feature diverse generation scattered all over the network including at distribution levels. Also there will be new loads such as electric vehicles and technologies including energy storage and lower voltage power flow control devices. The operation of these new networks will be possible by much greater use of information and communication technology (ICT) and control over the information networks.

The unit will cover recent relevant developments in energy technologies as well as important components of 'smart grids' such as supervisory control and data acquisition (SCADA), substation automation, remote terminal units (RTU), sensors and intelligent electronic devices (IED). Operation of these electricity grids requires a huge amount of data gathering, communication and information processing. The unit will discuss many emerging technologies for such data, information, knowledge and decision processes including communication protocols and network layouts, networking middleware and coordinated control. Information systems and data gathering will be used to assess key performance and security indicators associated with the operation of such grids including stability, reliability and power quality.

ELEC5211
Power Systems Dynamics and Control

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** ELEC3203 OR ELEC9203 OR ELEC5732 **Assumed knowledge:** The pre-required knowledge for learning this UoS is a deep understanding on circuit analysis and its applications in power system steady state analysis. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit deals with power systems modelling, analysis and simulation under dynamic conditions. The unit will cover the following topics:

- The links between power system steady state analysis and transient analysis

- Basics of dynamic system in general and stability analysis methods;

- Analysis of power systems subject to electromagnetic and electromechanical transients

- Power system modelling for stability analysis and electromagnetic transients analysis: Synchronous machine modelling using Park's transformation; Modelling of excitation systems and turbine governors; Modelling of the transmission system; Load modelling.

- Simulation of interconnected multi-machine systems

- Stability analysis: Transient stability; Small signal stability; Voltage stability;

- Power system control: Voltage control; Power system transient stability control; Power system dynamic stability control; Emergency control.

The unit is a specialist Unit for MPE (Power) and ME (Electrical and Power). It is also available as a recommended elective for BE Electrical (Power).

ELEC5212
Power Systems Planning and Markets

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/fortnight. **Prerequisites:** ELEC3203 OR ELEC9203 **Assumed knowledge:** The pre-required knowledge for learning this UoS is power system steady state analysis **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Deregulation of the electricity industry has fundamentally changed the power systems operation paradigm. The focus has shifted from central planning of vertically integrated utilities to market driven operation. Traditional electric energy producers and consumers play new roles in a power market environment and their behaviors are affected by the economic incentives to a large extent. Nevertheless, electric energy is a special commodity and cannot be traded as the other common goods. So a power market design has many special considerations compared with a conventional commercial market design. Knowledge of the power market mechanisms has become a necessary part in fully understanding the whole power system operations. To equip students with necessary skills to address the challenges of modern power systems, the unit will cover the following topics:

- Overview of the traditional electricity industry structure and operation: Economic dispatch, Power system operation states and respective reliability requirements.

- Drivers for the restructuring of the electricity industry.

- Electricity market design: Market structures (spot, bilateral, hybrid) ; Energy market; Ancillary services market; Key components in an electricity market;

- Electricity market participants and their roles in a market.

- Electricity economics: Power market from suppliers' view (Supply curve) and from demands' view (Demand curve); Market mechanism; Price and its elasticity; Cost and supply; Market power and monopoly.

- Cost of capital: Time value of money; Project evaluation methods from investments' point of view; Risk and return;

- Operation mechanisms of various designs of power markets;

- Power market practices around the world;

- Power system expansion planning: Fundamental knowledge of power system planning considerations, procedures and methods; Transmission planning; Generation planning; Power system adequacy assessment.

ELEC5212 is a specialist Unit for MPE (Power) and ME (Electrical and Power). It is also available as a recommended elective for BE Electrical (Power). This unit focuses on the power market principles and practices. Based on the knowledge of the power market operation, the power system planning procedures and methods will also be discussed.

ELEC5303
Computer Control System Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **Assessment:** Through semester assessment (44%) Final Exam (56%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5403
Radio Frequency Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorial 2 hrs/week; Lecture 2 hrs/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3305, ELEC3506, ELEC3607 and ELEC5508 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aim to teach the fundamentals concepts associated with:

oNetworked Embedded Systems, wireless sensor networks

oWireless channel propagation and radio power consumption

oWireless networks, ZigBee, Bluetooth, etc.

oSensor principle, data fusion, source detection and identification

oMultiple source detection, multiple access communications.

oNetwork topology, routing, network information theory

oDistributed source channel coding for sensor networks

oPower-aware and energy-aware communication protocols.

oDistributed embedded systems problems such as time synchronization and node localization,

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.

oAbility to identify the main issues and trade-offs in networked embedded systems.

oUnderstanding of the state-of-the-art solutions in the area

oBased on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.

oFamiliarization with a simulator platform and real hardware platforms for network embedded systems through the students involvement in project

ELEC5516
Electrical and Optical Sensor Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hours per week; Tutorial 1 hour per week; E-Learning 1 hour per week; Laboratory: 8 hours overall. **Assumed knowledge:** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The course focuses on environmentally friendly, intelligent sensors for multiple parameters monitoring to be used in power network and broadband network. The concepts learnt in this unit will be heavily used in various engineering applications in power systems, fiber optic systems and health monitoring. These concepts include:

-Theory, design and applications of optical fiber sensors.

-Sensor technologies for the growth of smart grid in power engineering.
-Actuators and motors for electrical sensor and its applications.

-Wearable sensor technologies for ehealth monitoring.

ELEC5701
Technology Venture Creation

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Workgroup 1 hr/week. **Prohibitions:** ENGG5102 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

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.

This course is taught by instructors experienced in technology startups & venture capital. The course will include a number of guest lectures by industry.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B covers the second of stage writing up and presenting the research results, and Capstone Project B extended allows the student to investigate a topic of greater depth and scope.

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.

ELEC5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5222, ELEC8902, ENGG5223, ELEC8901 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

ELEC5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ELEC8901, ELEC8902, ENGG5223, ENGG5222 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

With permission from the Head of Department candidates progressing with distinction (75%) average or higher results may replace ELEC5020, ELEC2021 and 12 cp of electives with ELEC5222 & ELEC5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

COMP5416
Advanced Network Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

ELEC5803
Advanced Bioelectronics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) **Assumed knowledge:** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will cover advanced topics in the application of electronics and signal processing to physiological monitoring, biosensors, electrical stimulation and medical imaging. Electrical safety and regulations of medical devices in Australia will be introduced. Guest lectures will describe the different needs and requirements in several clinical areas including neonatal care, oncology, cardiology and neurology.

Assumed Knowledge: A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Fluids Engineering

Course overview

The Earth's biosphere is completely immersed in environmental fluids. Air and water are both considered fluids and therefore every living creature on the planet is affected by the behaviour and quality of these media.

A postgraduate major in Fluids Engineering will teach you about fluid mechanics and engineering systems that are associated with the fluid environment.

Areas of study include wind engineering, reservoir stream and coastal engineering, advanced computational fluid dynamics and advanced water resources management.

Course requirements

To meet requirements for the Master of Engineering majoring in Fluids Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- A minimum of 12 credit points of research units
- A maximum of 12 credit points of elective units

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points of Core/Specialist/Research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Fluids Engineering			
To meet requirements for the Master of Engineering majoring in Fluids Engineering a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
AFNR5512 **Water Management and Variable Climate**	6	**A** UG Maths or Physics or Hydrology.	Semester 2
CHNG5005 **Wastewater Engineering**	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 1
CIVL5666 **Open Channel Flow & Hydraulic Structures**	6	**A** Advanced knowledge of fluid mechanics is necessary for this UoS.	Semester 1
CIVL5668 **Wind Engineering for Design-Fundamentals**	6		Semester 1
CIVL5669 **Applied Fluid Engineering Computing**	6	**A** CIVL5511 or CIVL9612. 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
Research units			
All candidates are required to complete a minimum of 12 credit points from the following units:			
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *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*
CIVL5222 **Dissertation A**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
CIVL5223 **Dissertation B**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
With permission from the Program Director candidates progressing with distinction (75%) average or higher results may replace CIVL5020, CIVL52021 and 12 cp of electives with CIVL5222 & CIVL5223 Dissertation A & B.			

Elective units

Candidates may complete a maximum of 12 credit points from the following units:

Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.

Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

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
CIVL5266 **Steel Structures - Stability**	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis.	Semester 1
CIVL5269 **Concrete Structures - Strength & Service**	6	**P** CIVL3205 OR CIVL5507 OR CIVL9205	Semester 2
CIVL5351 **Geoenvironmental Engineering**	6		Semester 1
CIVL5452 **Foundation Engineering**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity)	Semester 1
CIVL5458 **Numerical Methods in Civil Engineering**	6		Semester 1
CIVL5665 **Advanced Water Resources Management**	6	**A** CIVL3612	Semester 2
CIVL5670 **Reservoir Stream & Coastal Eng**	6	**A** CIVL3612 and MATH2061.	Semester 1
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Fluids Engineering

To meet requirements for the Master of Engineering majoring in Fluids Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

AFNR5512
Water Management and Variable Climate

Credit points: 6 **Teacher/Coordinator:** A/Prof Willem Vervoort **Session:** Semester 2 **Classes:** 3 hr workshop/week, practical work, project work **Assumed knowledge:** UG Maths or Physics or Hydrology. **Assessment:** Assignments (30%), project report (20%), 2 hr exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit builds on knowledge gained in undergraduate soil science and crop science units to develop an understanding of catchment water management. Particular focus will be on the effect of climate variability and change on water management decisions on output and externalities (Salinity, landscape losses). At the completion of this unit student would be able to: Identify which climate variables will be most affected by climate change and variability; Evaluate which field and farm scale outputs will be most affected by climate change and variability; Develop scenarios based on distributions of climate variability; and Calculate the likely impacts of climate variability and change on streamflow, water availability and irrigation water demand using Monte Carlo techniques.

The open source software package SWAT will be used for most analysis and other open source software will be used if needed.

Textbooks

Rees W.G. 2001. Physical principles of remote sensing. 2nd ed. Cambridge University Press, Cambridge, United Kingdom.

CHNG5005
Wastewater Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Group assignment 2 hrs/week; Site Visit 5 hrs/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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to acquaint students with the application of chemical engineering concepts and practice in an environmental context, the important example of wastewater treatment will be explored.

The key issues that will be considered are: Wastewater creation and characterisation; Wastewater treatment costs; Primary, secondary and tertiary treatment options; High-rate anaerobic and aerobic treatment options; Sludge management and water recovery/reuse options; Process integration considerations.

By the end of this UOS, a student should have gained an engineering-based appreciation of the technical, economic and social challenges posed by wastewater generation and its cost-effective treatment.

This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught here are relevant to the real-world practice of chemical engineering across a broad range of industries.

CIVL5666
Open Channel Flow & Hydraulic Structures

Credit points: 6 **Session:** Semester 1 **Assumed knowledge:** Advanced knowledge of fluid mechanics is necessary for this UoS. **Assessment:** Through semester assessment (100%) **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.

CIVL5668
Wind Engineering for Design-Fundamentals

Credit points: 6 **Session:** Semester 1 **Assessment:** Through semester assessment (60%) Final Exam (40%) **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, dynamic response of structures, and how all the above relates to AS1170.2.

CIVL5669
Applied Fluid Engineering Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **Assumed knowledge:** CIVL5511 or CIVL9612. 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit is to provide students with advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving thermal fluid 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.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

Capstone Project 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 Capstone Project course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021) or this unit Capstone Project B extended (CIVL5022) worth 12 credit points. This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

CIVL5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

With permission from the Program Director candidates progressing with distinction (75%) average or higher results may replace CIVL5020, CIVL52021 and 12 cp of electives with CIVL5222 & CIVL5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 2 hrs/week; Lecture 1 hr/week; Tutorial 1 hr/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. **Assessment:** Through semester assessment (100%) **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/diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

CIVL5266
Steel Structures - Stability

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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.

CIVL5269
Concrete Structures - Strength & Service

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** CIVL3205 OR CIVL5507 OR CIVL9205 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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). Strut-and-tie modelling of reinforced concrete members is also described. Design guidelines will reflect requirements of the Australian Standards and Eurocodes.

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;

- ability to use strut-and-tie models of reinforced concrete behaviour.

CIVL5351
Geoenvironmental Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **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.

Learning Outcomes: 1. Analyse flow regime in soil using Darcy equation; 2. Analyse contaminant migration in soil using coupled flow and reactive diffusion advection equations; 3. Design a single or double composite landfill liner satisfying groundwater quality requirements; 4. Predict the potential for methane production in a landfill and assess the feasibility of waste-to-energy conversion; 5. Conduct research on a geoenvironmental topic as part for group.

Syllabus Summary: introduction to geoenvironmental engineering; integrated waste management and life cycle assessment; soil composition and mineralogy; types and characteristics of contaminants; theory of water seepage in soil and hydraulic conductivity; theory of reactive contaminant transport in soil including molecular diffusion, mechanical dispersion and advective flow; analytical and numerical solutions of reactive diffusion advection equation; design of landfills; geosynthetics and geomembranes; defects and leakage rates; methane generation in landfills and landfill gas management.

CIVL5452
Foundation Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 3 hrs per week, presented in 2 sessions per week for 11 weeks of semester. Tutorials 1hr per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity) **Assessment:** Through semester assessment (100%) **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.

CIVL5458
Numerical Methods in Civil Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives:

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.

CIVL5665
Advanced Water Resources Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL3612 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit of study is to introduce students and professionals to water resources engineering. The aim of this unit is to provide an understanding of: hydrologic cycle from the broadest perspective, physical, chemical and biological characterization of water, how to change the water quality parameters, water quality control and management, water quality in the environment, nutrient and contaminant cycling and removal, water treatment methods for drinking, wastewater and groundwater, conservation/reuse/treatment techniques, desalination, stormwater, bioremediation and phytoremediation techniques. The topics mentioned above will be covered in both a qualitative and quantitative aspects. A basic level of integral and differential calculus is required as well as knowledge and use of calculation software such as Excell and Matlab.

CIVL5670
Reservoir Stream & Coastal Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs/week; Tutorials 2 hrs/week. **Assumed knowledge:** CIVL3612 and MATH2061. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

(Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Geomechanical Engineering

Course overview

A postgraduate major in Geomechanical Engineering will teach you about the engineering behaviour of earth materials.

You will learn how to examine the soil and rock layers that make up the earth in order to determine their physical and chemical properties to design foundations and earthworks structures for buildings, roads, and many other types of projects.

Areas of study include environmental geotechnics, numerical methods of engineering, and rock engineering.

Course requirements

To meet requirements for the Master of Engineering majoring in Geomechanical Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of Core units
- 24 credit points of Specialist units
- A minimum of 12 credit points of Research units
- A maximum of 12 credit points of Elective units

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points of core/specialist/research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Master of Engineering majoring in Geomechanical Engineering			
To meet requirements for the Master of Engineering majoring in Automation and Manufacturing a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
CIVL5450 **Analysis and Design of Pile Foundations**	6		Semester 1
CIVL5453 **Geotechnical Hazards**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity).	Semester 2
CIVL5458 **Numerical Methods in Civil Engineering**	6		Semester 1
CIVL5454 **Rock Engineering**	6	**A** Undergraduate geology and soil mechanics	Semester 2
CIVL5455 **Engineering Behaviour of Soils**	6	**A** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential.	Semester 2
Research units			
All candidates are required to complete a minimum of 12 credit points from the following units:			
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2
CIVL5222 **Dissertation A**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5223 **Dissertation B**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
With permission from the Program Director candidates progressing with distinction (75%) average or higher results may replace CIVL5020, CIVL52021 and 12 cp of electives with CIVL5222 & CIVL5223 Dissertation A & B.			
Elective units Candidates may complete a maximum of 12 credit points from the following units: Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director. Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.			
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
CIVL5266 **Steel Structures - Stability**	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis.	Semester 1
CIVL5269 **Concrete Structures - Strength & Service**	6	**P** CIVL3205 OR CIVL5507 OR CIVL9205	Semester 2
CIVL5351 **Geoenvironmental Engineering**	6		Semester 1
CIVL5453 **Geotechnical Hazards**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity).	Semester 2
CIVL5665 **Advanced Water Resources Management**	6	**A** CIVL3612	Semester 2
CIVL5670 **Reservoir Stream & Coastal Eng**	6	**A** CIVL3612 and MATH2061.	Semester 1
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Geomechanical Engineering

To meet requirements for the Master of Engineering majoring in Automation and Manufacturing a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

CIVL5450
Analysis and Design of Pile Foundations

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week; Project Work - own time 6 hrs/week; Laboratory 3 hrs/week. **Assessment:** Through semester assessment (100%) **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.

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.

CIVL5453
Geotechnical Hazards

Credit points: 6 **Teacher/Coordinator:** Pierre Rognon **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 1 hour per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity). **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Geotechnical flows include landslides, rock falls and mud flows. They are triggered by soil failure due to natural or human causes. The objective of this Unit of Study is to develop the ability to assess and mitigate the risks associated to such events. Students will learn how to estimate when and where these events are likely to occur, how to define safety zones and how to design effective protection structures. The syllabus is comprised of (i) Landslide Risk Assessment and Management procedures (ii) post-faillure and out of equilibrium soil mechanics applied to prediction of rock fall, landslide and mud flow run-out distance and impact force on structures; (iii) design of geotechnical protection structures.

CIVL5458
Numerical Methods in Civil Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives:

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.

CIVL5454
Rock Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Laboratory 3 hrs/week. **Assumed knowledge:** Undergraduate geology and soil mechanics **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives: to develop an understanding of the behaviour and design of engineering structures in rock masses

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.

CIVL5455
Engineering Behaviour of Soils

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential. **Assessment:** Through semester assessment (100%) **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.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone

Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

Capstone Project 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 Capstone Project course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021) or this unit Capstone Project B extended (CIVL5022) worth 12 credit points. This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

CIVL5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

With permission from the Program Director candidates progressing with distinction (75%) average or higher results may replace CIVL5020, CIVL52021 and 12 cp of electives with CIVL5222 & CIVL5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 2 hrs/week; Lecture 1 hr/week; Tutorial 1 hr/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. **Assessment:** Through semester assessment (100%) **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/diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

CIVL5266
Steel Structures - Stability

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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.

CIVL5269
Concrete Structures - Strength & Service

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** CIVL3205 OR CIVL5507 OR CIVL9205 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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). Strut-and-tie modelling of reinforced concrete members is also described. Design guidelines will reflect requirements of the Australian Standards and Eurocodes.

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;

- ability to use strut-and-tie models of reinforced concrete behaviour.

CIVL5351
Geoenvironmental Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **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.

Learning Outcomes: 1. Analyse flow regime in soil using Darcy equation; 2. Analyse contaminant migration in soil using coupled flow and reactive diffusion advection equations; 3. Design a single or double composite landfill liner satisfying groundwater quality requirements; 4. Predict the potential for methane production in a landfill and assess the feasibility of waste-to-energy conversion; 5. Conduct research on a geoenvironmental topic as part for group.

Syllabus Summary: introduction to geoenvironmental engineering; integrated waste management and life cycle assessment; soil composition and mineralogy; types and characteristics of contaminants; theory of water seepage in soil and hydraulic conductivity; theory of reactive contaminant transport in soil including molecular diffusion, mechanical dispersion and advective flow; analytical and numerical solutions of reactive diffusion advection equation; design of landfills; geosynthetics and geomembranes; defects and leakage rates; methane generation in landfills and landfill gas management.

CIVL5453
Geotechnical Hazards

Credit points: 6 **Teacher/Coordinator:** Pierre Rognon **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 1 hour per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity). **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Geotechnical flows include landslides, rock falls and mud flows. They are triggered by soil failure due to natural or human causes. The objective of this Unit of Study is to develop the ability to assess and mitigate the risks associated to such events. Students will learn how to estimate when and where these events are likely to occur, how to define safety zones and how to design effective protection structures. The syllabus is comprised of (i) Landslide Risk Assessment and Management procedures (ii) post-faillure and out of equilibrium soil mechanics applied to prediction of rock fall, landslide and mud flow run-out distance and impact force on structures; (iii) design of geotechnical protection structures.

CIVL5665
Advanced Water Resources Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL3612 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit of study is to introduce students and professionals to water resources engineering. The aim of this unit is to provide an understanding of: hydrologic cycle from the broadest perspective, physical, chemical and biological characterization of water, how to change the water quality parameters, water quality control and management, water quality in the environment, nutrient and contaminant cycling and removal, water treatment methods for drinking, wastewater and groundwater, conservation/reuse/treatment techniques, desalination, stormwater, bioremediation and phytoremediation techniques. The topics mentioned above will be covered in both a qualitative and quantitative aspects. A basic level of integral and differential calculus is required as well as knowledge and use of calculation software such as Excell and Matlab.

CIVL5670
Reservoir Stream & Coastal Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs/week; Tutorials 2 hrs/week. **Assumed knowledge:** CIVL3612 and MATH2061. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

(Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Mechanical Engineering

Course overview

A postgraduate major in Mechanical Engineering will provide you with an advanced understanding of the design of mechanical components, whole machines, mechanical systems and mechanical processes.

You will learn how to analyse mechanical design, using the principles of motion, energy, and force to ensure the safety and reliability of products, and you will understand how efficient systems and processes support the manufacture of products at a competitive cost.

Areas of study include advanced computational fluid analysis, experimental robotics, advanced combustion and computational nanotechnology.

Course requirements

To meet requirements for the Master of Engineering majoring in Mechanical Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- A minimum of 12 credit points of research units
- A maximum of 12 credit points of elective units.

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points of Core/Specialist/Research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Mechanical Engineering			
To meet requirements for the Master of Engineering majoring in Mechanical Engineering a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field. *Note: Department permission required for enrolment* *Department Permission required for Enrolment*	Semester 2
AERO9301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field. **P** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **N** AERO5301	Semester 1
AMME5101 **Energy and the Environment**	6	**P** 24 credits of 3000-level or above units of study	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** The students will require 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. *Note: Department permission required for enrolment*	Semester 2
AMME5310 **Engineering Tribology**	6	**A** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261)	Semester 1
AMME5510 **Vibration and Acoustics**	6	**A** (AMME2301 OR AMME9301) AND AMME2200 AND (AMME2500 OR AMME9500) *Note: Department permission required for enrolment*	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. *Note: Department permission required for enrolment*	Semester 2
AMME5902 **Advanced Computer Aided Manufacturing**	6		Semester 2
AMME5912 **Crash Analysis and Design**	6	**A** Computer Aided Drafting, Basic FEA principles and Solid Mechanics	Semester 1
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. **P** MECH3260 **N** MECH4255	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
MECH5265 **Advanced Combustion**	6	**A** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **P** (MECH3260 AND MECH3261) OR MECH5262 OR MECH9260	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. **P** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) *Note: Department permission required for enrolment*	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 *The UoS covers the key knowledge of most smart materials such as dielectric, piezoelectric, magneto-electric and shape memory materials. Each student participates in a couple of group projects relevant to characterization of structure-property relationship of functional structures with desired performance. Under the guidance of the supervisor, the student will learn how to develop a proposal, how to do the project investigation and how to prepare and carry out the technical communications (writing and oral). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.*	Semester 2
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310 *Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.*	Semester 1
MECH5416 **Advanced Design and Analysis**	6	**A** 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	Semester 1
MECH5720 **Sensors and Signals**	6	**A** Strong MATLAB skills **N** MECH4720	Semester 2
MTRX5700 **Experimental Robotics**	6	**A** Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed. **P** (AMME3500 OR AMME9501) AND MTRX3700	Semester 1

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study).	Semester 1 Semester 2
AMME5021 **Capstone Project B**	6	**C** AMME5020	Semester 1 Semester 2
AMME5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2
AMME5222 **Dissertation A**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2
AMME5223 **Dissertation B**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2

With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace AMME5020, AMME5021 and 12 cp of electives with AMME5222 & AMME5223, Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:

Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.

Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AERO5200 **Advanced Aerodynamics**	6	**A** BE in the area of Aerospace Engineering or related Engineering field. **P** AERO5210 OR AERO9260 OR AERO3260 *Note: Department permission required for enrolment*	Semester 1
AERO5400 **Advanced Aircraft Design Analysis**	6	**A** (AERO1400, AERO3260, AERO3261, AERO3360, AERO3465, AERO3560, AERO4460) or equivalent. **P** AERO3460 OR AERO5410 OR AERO9460 **N** : AERO4491	Semester 2
AERO5500 **Flight Mechanics Test and Evaluation Adv**	6	**A** BE in the area of Aerospace Engineering or related Engineering field. **P** AERO5510 OR AERO9560 OR AERO3560	Semester 2
AERO5760 **Spacecraft and Satellite Design** *This unit of study is not available in 2015*	6	*Note: Department permission required for enrolment*	Semester 2
AMME5520 **Advanced Control and Optimisation**	6	**A** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **P** AMME3500 OR AMME5501 OR AMME9501	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME5951 **Fundamentals of Neuromodulation**	6	**A** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent.	Semester 1
AMME5961 **Biomaterials Engineering** *This unit of study is not available in 2015*	6	**A** Recommended 6 credit points of junior biology 6 credit points of junior chemistry 6 credit points of junior materials science 6 credit points of engineering design	Semester 2
AMME5971 **Applied Tissue Engineering** *This unit of study is not available in 2015*	6	**A** 6 credit points of junior biology,6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent.	Semester 1
AMME5981 **Computational Biomedical Engineering** *This unit of study is not available in 2015*	6	**A** AMME5301 and AMME5302 and AMME5500 and MECH5361 and MECH3921	Semester 1
AMME5990 **Biomedical Engineering Tech 1** *This unit of study is not available in 2015*	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
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Mechanical Engineering

To meet requirements for the Master of Engineering majoring in Mechanical Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

AERO5010
Optimisation Methods in Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time 10 hrs/week. **Assumed knowledge:** BE in the area of Aerospace or related Engineering field. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Department Permission required for Enrolment

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.

Note: Department Permission required for enrolment

AERO9301
Applied Finite Element Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** 2.5 hours of lectures and 2 hours of workgroup session per week **Prerequisites:** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **Prohibitions:** AERO5301 **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (55%), Final Exam (45%) **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.

AMME5101
Energy and the Environment

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - own time 2 hrs/week. **Prerequisites:** 24 credits of 3000-level or above units of study **Assessment:** Through semester assessment (100%) **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.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 2 hrs/week; Lecture 1 hr/week; Tutorial 1 hr/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. **Assessment:** Through semester assessment (100%) **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/diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 3 hrs/week. **Assumed knowledge:** The students will require 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

AMME5310
Engineering Tribology

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs; Tutorial 3 hrs/week; Seminar 3 hrs/week. **Assumed knowledge:** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim is to teach students in the undergraduate and postgraduate levels basic concepts about friction, lubrication and wear applicable to design and operation of mechanical systems used in engineering, industrial, and modern applications. Examples of these systems are lubrication of internal combustion engines, gearboxes, artificial hip/knee joints, and micro/nano electromechanical systems.

AMME5510
Vibration and Acoustics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** (AMME2301 OR AMME9301) AND AMME2200 AND (AMME2500 OR AMME9500) **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This UoS should prepare the student to be able to undertake vibration and acoustic measurement calculations for industry design situations.

The unit aims to introduce a number of new concepts required for analysis of vibrations and acoustics. The response of structure under different dynamic forces, including human and aerodynamic, will be investigated. A number of hands-on experiments will be performed to allow an understanding of the concepts and applicability.

The acoustics component will include: basic acoustics theory, sound generation and propagation, impedance, absorbing materials, industrial noise sources, isolation methods of noise control, enclosures, instrumentation and measurement, frequency analysis, noise regulations and computational acoustics.

AMME5602
Product Life Cycle Design

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 5 hrs/week. **Assumed knowledge:** Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This subject covers 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.

AMME5902
Advanced Computer Aided Manufacturing

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class, Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory, Seminar, **Assessment:** Through semester assessment (100%) **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

oHow to successfully complete a CAD/CAM and CNC mill based project.

oManufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;

oThe science in designing and selecting a manufacturing method.

oHow to effectively present your ideas and outcomes using oral and report based methods.

It is expected that through your hard work in the semester, you will find

oEnhanced learning by real-world problems.

oImproved comprehensive skill in manufacturing design.

AMME5912
Crash Analysis and Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - own time, **Assumed knowledge:** Computer Aided Drafting, Basic FEA principles and Solid Mechanics **Assessment:** Through semester assessment (100%) **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-PreSys, 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.

MECH5255
Air Conditioning and Refrigeration (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prerequisites:** MECH3260 **Prohibitions:** MECH4255 **Assumed knowledge:** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

MECH5265
Advanced Combustion

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prerequisites:** (MECH3260 AND MECH3261) OR MECH5262 OR MECH9260 **Assumed knowledge:** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

MECH5275
Advanced Renewable Energy

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) **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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

MECH5305
Smart Materials

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 3 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The UoS covers the key knowledge of most smart materials such as dielectric, piezoelectric, magneto-electric and shape memory materials. Each student participates in a couple of group projects relevant to characterization of structure-property relationship of functional structures with desired performance. Under the guidance of the supervisor, the student will learn how to develop a proposal, how to do the project investigation and how to prepare and carry out the technical communications (writing and oral). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.

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:** Lecture 2 hrs/week; Tutorial 3 hrs/week; Laboratory 3 hrs. **Prohibitions:** MECH4310 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.

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.

MECH5416
Advanced Design and Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

1. 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.

2. 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.

3. 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.

MECH5720
Sensors and Signals

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 3 hrs/week; Project Work - own time 2 hrs/week; Presentation 2 hrs; Laboratory 2 hrs; Tutorial 2 hrs/week. **Prohibitions:** MECH4720 **Assumed knowledge:** Strong MATLAB skills **Assessment:** Through semester assessment (75%) Final Exam (25%) **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: Convolution, The Fourier Transform, Modulation (FM, AM, FSK, PSK etc), Frequency shifting (mixing)

b) PASSIVE SENSORS: Infrared Radiometers, Imaging Infrared, Passive Microwave Imaging, Visible Imaging & Image Intensifiers

c) ACTIVE SENSORS THE BASICS: Operational Principles, Time of flight (TOF) Measurement & Imaging of Radar, Lidar and Sonar, Radio Tags and Transponders, Range Tacking, 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.

MTRX5700
Experimental Robotics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 3 hrs/week; Lecture 2 hrs/week. **Prerequisites:** (AMME3500 OR AMME9501) AND MTRX3700 **Assumed knowledge:** Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed. **Assessment:** Through semester assessment (70%) Final Exam (30%) **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 manufacturing, automobile systems and assembly systems; develop the capacity to think critically 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.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

AMME5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Corequisites:** AMME5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B Extended covers the second of stage writing up and presenting the research results. This extended version of Capstone Project allows the student to investigate a topic of greater depth and scope.

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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

AMME5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace AMME5020, AMME5021 and 12 cp of electives with AMME5222 & AMME5223, Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

AERO5200
Advanced Aerodynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** AERO5210 OR AERO9260 OR AERO3260 **Assumed knowledge:** BE in the area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (100%) **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 and aerodynamics. The develop familiarity with the techniques for predicting airflow/structure interactions for aerospace vehicles.

Syllabus Summary:

(a) Advanced two and three dimensional panel method techniques; calculation of oscillatory flow results; prediction of aerodynamic derivatives. Pressure distributions for complete aircraft configuration. Unsteady subsonic flow analysis of aircraft; calculation of structural modes. Structural response to gusts; aeroelasticity; flutter and divergence. Solution of aerospace flow problems using finite element methods.

(b) Unsteady supersonic one-dimensional flow. Hypersonic flow; real gas effects. Introduction to the use of CFD for transonic flow.

(c) Rarefied gas dynamics. Direct simulation method (DSMC); near-continuum solutions. Simulation techniques for numerical solutions of non-linear continuum flow.

AERO5400
Advanced Aircraft Design Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Lecture 2 hrs/week; Meeting 2 hrs/week. **Prerequisites:** AERO3460 OR AERO5410 OR AERO9460 **Prohibitions:** : AERO4491 **Assumed knowledge:** (AERO1400, AERO3260, AERO3261, AERO3360, AERO3465, AERO3560, AERO4460) or equivalent. **Assessment:** Through semester assessment (100%) **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.

AERO5500
Flight Mechanics Test and Evaluation Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 3 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** AERO5510 OR AERO9560 OR AERO3560 **Assumed knowledge:** BE in the area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (100%) **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.

AERO5760
Spacecraft and Satellite Design

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours of project work in class per week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

Planetary observation using robotics and intelligents systems will grow in importance over the next decade. These systems can take the form of either intelligent spacecraft, robotic air vehicles or planetary rovers. In this subject we will study a wide range of robotic spacecraft systems that are used for planetary observation and focus on their specifications as well as their internal systems. From a practical perspective will be working hands on with the Mars Rover developed at the University of Sydney to study the various intelligent components and how they come together.

AMME5520
Advanced Control and Optimisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Research 1 hr/week. **Prerequisites:** AMME3500 OR AMME5501 OR AMME9501 **Assumed knowledge:** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces engineering design via optimization, i.e. finding the "best possible" solution to a particular problem. For example, an autonomous vehicle must find the fastest route between two locations over a road network; a biomedical sensing device must compute the most accurate estimate of important physiological parameters from noise-corrupted measurements; a feedback control system must stabilize and control a multivariable dynamical system (such as an aircraft) in an optimal fashion.

The student will learn how to formulate a design in terms of a "cost function", when it is possible to find the "best" design via minimization of this "cost", and how to do so. The course will introduce widely-used optimization frameworks including linear and quadratic programming (LP and QP), dynamic programming (DP), path planning with Dijkstra's algorithm, A*, and probabilistic roadmaps (PRMs), state estimation via Kalman filters, and control via the linear quadratic regulator (LQR) and Model Predictive Control (MPC). There will be constant emphasis on connections to real-world engineering problems in control, robotics, aerospace, biomedical engineering, and manufacturing.

AMME5951
Fundamentals of Neuromodulation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Implantable microelectronic devices functioning either as nerve stimulators or nerve blockers comprise one of the largest markets in the global medical device industry. The aim of this unit of study is to give students a complete overview of the underlying technology (microelectronics, encapsulation biomaterials, electrode biomaterials, electrode-neural interactions, inductive power systems and data links, signal processing) and an expert review of the major technological applications on the market, which include Cochlear implants, pacemakers and implantable defibrillators, deep brain stimulators, pain control nerve blockers, bionic eye implants, functional electrical stimulation systems. The unit will also review emerging applications such as gastrointestinal disorders, obesity; vagal nerve stimulation - epilepsy, depression, carotid artery stimulation - hypertension, spinal cord stimulation - ischemic disorders, angina, peripheral vascular disease, incontinence, erectile dysfunction. The unit will conclude with a snapshot of the future: "brain on a chip" progress, nerve regrowth, neurotropins, drug/device combinations. This is a Master of Professional Engineering Unit of Study intended for biomedical engineering students with an interest in working in the medical device industry in the large market sector area of implantable electronic devices.

AMME5961
Biomaterials Engineering

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 2 **Classes:** : Lectures: 3 hours per week **Assumed knowledge:** Recommended 6 credit points of junior biology 6 credit points of junior chemistry 6 credit points of junior materials science 6 credit points of engineering design **Assessment:** Through semester assessment (60%), Final Exam (40%) **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

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures: 2 hours per week; Tutorials: 2 hours per week **Assumed knowledge:** 6 credit points of junior biology,6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (60%), Final Exam (40%) **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:

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.

AMME5981
Computational Biomedical Engineering

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures: 2 hours per week; Tutorials: 2 hours per week **Assumed knowledge:** AMME5301 and AMME5302 and AMME5500 and MECH5361 and MECH3921 **Assessment:** Through semester assessment (100%) **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 optimization.

AMME5990
Biomedical Engineering Tech 1

This unit of study is not available in 2015

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. **Assessment:** Through semester assessment (100%) **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.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Power Engineering

Course overview

A postgraduate major in Power Engineering is concerned with the study of power systems, specifically electric power generation, transmission and distribution, power conversion, and electromechanical devices.

This will provide you with advanced skills to plan, design, construct, operate and maintain power systems and equipment.

Areas of study include high voltage engineering, sustainable energy systems and power systems analysis and protection.

Course requirements

To meet requirements for the Master of Engineering majoring in Power Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- a minimum of 12 credit points of research units
- a maximum of 12 credit points of elective units.

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points of Core/Specialist/Research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Power Engineering			
To meet requirements for the Master of Engineering majoring in Power Engineering a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
ELEC5203 **Topics in Power Engineering**	6	**A** ELEC3203 Power Engineering and ELEC3204 Power Electronics and Drives.Familiarity with basic mathematics and physics; competence with basic circuit theory and understanding of electricity grid equipment such as transformers, transmission lines and associated modeling; and fundamentals of power electronic technologies.	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.	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. **P** ELEC3203 OR ELEC9203	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
ELEC5207 **Advanced Power Conversion Technologies**	6	**A** ELEC3204	Semester 2
ELEC5208 **Intelligent Electricity Networks**	6	**A** Fundamentals of Electricity Networks, Control Systems and Telecommunications	Semester 1
ELEC5211 **Power Systems Dynamics and Control**	6	**A** The pre-required knowledge for learning this UoS is a deep understanding on circuit analysis and its applications in power system steady state analysis. **P** ELEC3203 OR ELEC9203 OR ELEC5732	Semester 1
ELEC5212 **Power Systems Planning and Markets**	6	**A** The pre-required knowledge for learning this UoS is power system steady state analysis **P** ELEC3203 OR ELEC9203	Semester 2
Research units			
All candidates are required to complete a minimum of 12 credit points from the following units:			
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC5222 **Dissertation A**	12	**N** ENGG5222, ELEC8902, ENGG5223, ELEC8901 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
ELEC5223 **Dissertation B**	12	**N** ELEC8901, ELEC8902, ENGG5223, ENGG5222 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

With permission from the Head of Department candidates progressing with distinction (75%) average or higher results may replace ELEC5020, ELEC2021 and 12 cp of electives with ELEC5222 & ELEC5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:

Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.

Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	Semester 1
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. *Note: Department permission required for enrolment*	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.	Semester 1
ELEC5507 **Error Control Coding**	6	**A** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired.	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
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.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	Semester 2
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3305, ELEC3506, ELEC3607 and ELEC5508	Semester 2
ELEC5516 **Electrical and Optical Sensor Design**	6	**A** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis	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) **N** MECH5701	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2
ELEC5803 **Advanced Bioelectronics**	6	**A** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **P** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) *Note: Department permission required for enrolment*	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Power Engineering

To meet requirements for the Master of Engineering majoring in Power Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

ELEC5203
Topics in Power Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial-Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3203 Power Engineering and ELEC3204 Power Electronics and Drives.Familiarity with basic mathematics and physics; competence with basic circuit theory and understanding of electricity grid equipment such as transformers, transmission lines and associated modeling; and fundamentals of power electronic technologies. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides the basis for the analysis of electricity grids using symmetrical components theory. Such analysis theory is the basis for the understanding of electrical faults and the design of protection strategies to safeguard the electrical equipment, and maintain safety of the plant at the highest possible level.

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:** Lecture 2 hrs/week; Tutorial - Laboratory 2 hrs/week; Project Work - in class 2 hrs. **Prerequisites:** ELEC3203 OR ELEC9203 **Assumed knowledge:** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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:** Lecture 2 hrs/week; Tutorial 2 hrs/fortnight; Laboratory 2 hrsfortnight; Project Work - own time 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 power system both at distribution and transmission levels. 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 intelligent electricity networks and advanced energy conversion and power systems. The following topics are covered: modern power systems; distributed generation; co-generation; tri-generation; microturbines; fuel cells; renewable energy sources: solar, wind, hydro, biomass, wind turbines; photovoltaic; grid-connected power systems; stand-alone power systems.

ELEC5207
Advanced Power Conversion Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial - Laboratory 3 hrs/week; Project Work - own time 2 hrs/week. **Assumed knowledge:** ELEC3204 **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to cover advanced topics in power electronics and it applications. In particular, the power electronics interface design and implementation for microgrid, smart grids and modern power systems which have received tremendous attention in recent years. Many countries including Australia are developing different power electronics technologies such as integrating renewable energy sources into the grid, managing charging and discharging of high power energy storage system, controlling the reactive power of power electronics interfaces for grid stability, and adding communication capability to power electronics interfaces for smart meter implementation. The unit assumes prior fundamental knowledge of power electronics systems and applications, including the ability to analyse basic power converters for all four conversions (ac-ac, ac-dc, dc-ac, and ac-dc), and design and implement various applications, such as motor drive and battery charger, with the consideration of electrical characteristics of semiconductors and passive elements. This unit will cover advanced technologies on power electronics interfaces for smart grids and microgrid implementation, which include dynamic voltage restorer, active power filter, reactive power compensation, energy storage management, hybrid energy sources optimisation, multilevel inverter and control, D-STATCOM, etc. To analyse these advanced power conversion systems, some analytical techniques will be introduced. This includes resonant converters, soft-switching technique, ac equivalent circuit modeling, converter control and input/output filter design.

ELEC5208
Intelligent Electricity Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs/. **Assumed knowledge:** Fundamentals of Electricity Networks, Control Systems and Telecommunications **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to give students an introduction to the planning and operation of modern electricity grids, also known as "smart" grids. Traditional power networks featured a small number of large base-load plants sending power out over transmission lines to be distributed in radial lower voltage networks to loads. In response to the need to reduce carbon impact, future networks will feature diverse generation scattered all over the network including at distribution levels. Also there will be new loads such as electric vehicles and technologies including energy storage and lower voltage power flow control devices. The operation of these new networks will be possible by much greater use of information and communication technology (ICT) and control over the information networks.

The unit will cover recent relevant developments in energy technologies as well as important components of 'smart grids' such as supervisory control and data acquisition (SCADA), substation automation, remote terminal units (RTU), sensors and intelligent electronic devices (IED). Operation of these electricity grids requires a huge amount of data gathering, communication and information processing. The unit will discuss many emerging technologies for such data, information, knowledge and decision processes including communication protocols and network layouts, networking middleware and coordinated control. Information systems and data gathering will be used to assess key performance and security indicators associated with the operation of such grids including stability, reliability and power quality.

ELEC5211
Power Systems Dynamics and Control

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** ELEC3203 OR ELEC9203 OR ELEC5732 **Assumed knowledge:** The pre-required knowledge for learning this UoS is a deep understanding on circuit analysis and its applications in power system steady state analysis. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit deals with power systems modelling, analysis and simulation under dynamic conditions. The unit will cover the following topics:

- The links between power system steady state analysis and transient analysis

- Basics of dynamic system in general and stability analysis methods;

- Analysis of power systems subject to electromagnetic and electromechanical transients

- Power system modelling for stability analysis and electromagnetic transients analysis: Synchronous machine modelling using Park's transformation; Modelling of excitation systems and turbine governors; Modelling of the transmission system; Load modelling.

- Simulation of interconnected multi-machine systems

- Stability analysis: Transient stability; Small signal stability; Voltage stability;

- Power system control: Voltage control; Power system transient stability control; Power system dynamic stability control; Emergency control.

The unit is a specialist Unit for MPE (Power) and ME (Electrical and Power). It is also available as a recommended elective for BE Electrical (Power).

ELEC5212
Power Systems Planning and Markets

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/fortnight. **Prerequisites:** ELEC3203 OR ELEC9203 **Assumed knowledge:** The pre-required knowledge for learning this UoS is power system steady state analysis **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Deregulation of the electricity industry has fundamentally changed the power systems operation paradigm. The focus has shifted from central planning of vertically integrated utilities to market driven operation. Traditional electric energy producers and consumers play new roles in a power market environment and their behaviors are affected by the economic incentives to a large extent. Nevertheless, electric energy is a special commodity and cannot be traded as the other common goods. So a power market design has many special considerations compared with a conventional commercial market design. Knowledge of the power market mechanisms has become a necessary part in fully understanding the whole power system operations. To equip students with necessary skills to address the challenges of modern power systems, the unit will cover the following topics:

- Overview of the traditional electricity industry structure and operation: Economic dispatch, Power system operation states and respective reliability requirements.

- Drivers for the restructuring of the electricity industry.

- Electricity market design: Market structures (spot, bilateral, hybrid) ; Energy market; Ancillary services market; Key components in an electricity market;

- Electricity market participants and their roles in a market.

- Electricity economics: Power market from suppliers' view (Supply curve) and from demands' view (Demand curve); Market mechanism; Price and its elasticity; Cost and supply; Market power and monopoly.

- Cost of capital: Time value of money; Project evaluation methods from investments' point of view; Risk and return;

- Operation mechanisms of various designs of power markets;

- Power market practices around the world;

- Power system expansion planning: Fundamental knowledge of power system planning considerations, procedures and methods; Transmission planning; Generation planning; Power system adequacy assessment.

ELEC5212 is a specialist Unit for MPE (Power) and ME (Electrical and Power). It is also available as a recommended elective for BE Electrical (Power). This unit focuses on the power market principles and practices. Based on the knowledge of the power market operation, the power system planning procedures and methods will also be discussed.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B covers the second of stage writing up and presenting the research results, and Capstone Project B extended allows the student to investigate a topic of greater depth and scope.

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.

ELEC5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5222, ELEC8902, ENGG5223, ELEC8901 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

ELEC5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ELEC8901, ELEC8902, ENGG5223, ENGG5222 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

With permission from the Head of Department candidates progressing with distinction (75%) average or higher results may replace ELEC5020, ELEC2021 and 12 cp of electives with ELEC5222 & ELEC5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

COMP5416
Advanced Network Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

ELEC5303
Computer Control System Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **Assessment:** Through semester assessment (44%) Final Exam (56%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5403
Radio Frequency Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorial 2 hrs/week; Lecture 2 hrs/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3305, ELEC3506, ELEC3607 and ELEC5508 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aim to teach the fundamentals concepts associated with:

oNetworked Embedded Systems, wireless sensor networks

oWireless channel propagation and radio power consumption

oWireless networks, ZigBee, Bluetooth, etc.

oSensor principle, data fusion, source detection and identification

oMultiple source detection, multiple access communications.

oNetwork topology, routing, network information theory

oDistributed source channel coding for sensor networks

oPower-aware and energy-aware communication protocols.

oDistributed embedded systems problems such as time synchronization and node localization,

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.

oAbility to identify the main issues and trade-offs in networked embedded systems.

oUnderstanding of the state-of-the-art solutions in the area

oBased on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.

oFamiliarization with a simulator platform and real hardware platforms for network embedded systems through the students involvement in project

ELEC5516
Electrical and Optical Sensor Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hours per week; Tutorial 1 hour per week; E-Learning 1 hour per week; Laboratory: 8 hours overall. **Assumed knowledge:** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The course focuses on environmentally friendly, intelligent sensors for multiple parameters monitoring to be used in power network and broadband network. The concepts learnt in this unit will be heavily used in various engineering applications in power systems, fiber optic systems and health monitoring. These concepts include:

-Theory, design and applications of optical fiber sensors.

-Sensor technologies for the growth of smart grid in power engineering.
-Actuators and motors for electrical sensor and its applications.

-Wearable sensor technologies for ehealth monitoring.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

ELEC5803
Advanced Bioelectronics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) **Assumed knowledge:** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will cover advanced topics in the application of electronics and signal processing to physiological monitoring, biosensors, electrical stimulation and medical imaging. Electrical safety and regulations of medical devices in Australia will be introduced. Guest lectures will describe the different needs and requirements in several clinical areas including neonatal care, oncology, cardiology and neurology.

Assumed Knowledge: A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Software Engineering

Course overview

From the evolving internet to the growth of mobile, handheld and embedded devices, the critical need for engineers who can build our virtual world gets greater by the day.

Software engineering addresses all aspects of software production, from strategy and design to coding, quality and management.

Course requirements

To meet requirements for the Master of Engineering majoring in Software Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- a minimum of 12 credit points of research units
- a maximum of 12 credit points of elective units.

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points of Core/Specialist/Research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session

Master of Engineering majoring in Software Engineering

To meet requirements for the Master of Engineering majoring in Software Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

(a) 24 credit points of Core units

(b) 24 credit points of Specialist units

(c) A minimum of 12 credit points of Research units

(d) A maximum of 12 credit points of Elective units

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:

(a) A minimum of 12 credit points of Core units

(b) A minimum of 12 credit points of Specialist units

(c) A minimum of 12 credit points of Research units

(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.

Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.

Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.

Exchange units may be taken as Specialist units with the approval of the Program Director.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
COMP5424 **Information Technology in Biomedicine**	6		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) **N** MECH5701	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
ELEC5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC5222 **Dissertation A**	12	**N** ENGG5222, ELEC8902, ENGG5223, ELEC8901 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
ELEC5223 **Dissertation B**	12	**N** ELEC8901, ELEC8902, ENGG5223, ENGG5222 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
With permission from the Head of Department candidates progressing with distinction (75%) average or higher results may replace ELEC5020, ELEC2021 and 12 cp of electives with ELEC5222 & ELEC5223 Dissertation A & B.			

Elective units

Candidates may complete a maximum of 12 credit points from the following units:

Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.

Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5116 **Design of Networks & Distributed Systems**	6		Semester 2
COMP5211 **Algorithms** *This unit of study is not available in 2015*	6	**A** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. Some knowledge of computer programming is required.	Semester 2
COMP5347 **Web Application Development**	6	**A** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams.	Semester 1
COMP5348 **Enterprise Scale Software Architecture**	6	**A** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.	Semester 1
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	Semester 1
COMP5456 **Introduction to Bioinformatics** *This unit of study is not available in 2015*	6	**A** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **N** COMP3456	Summer Main
COMP9103 **Software Development in Java**	6	**N** COMP5214	Semester 1 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
ELEC5208 **Intelligent Electricity Networks**	6	**A** Fundamentals of Electricity Networks, Control Systems and Telecommunications	Semester 1
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. *Note: Department permission required for enrolment*	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
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.	Semester 2
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3305, ELEC3506, ELEC3607 and ELEC5508	Semester 2
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5701 **Technology Venture Creation**	6	**N** ENGG5102	Semester 2
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July
INFO5010 **IT Advanced Topic A**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Late
INFO6010 **Advanced Topics in IT Project Management**	6	**A** Students are assumed to understand the role of IT projects. **P** INFO6007, OR 3-5 years working experience in IT Project Management	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
INFS6004 **Business Transformation Projects**	6	**A** Understanding the major functions of a business and how those business functions interact internally and externally so the company can be competitive in the market is essential in order to critically analyse how a business can be transformed. Experience as a member of a project team is desirable.	Semester 1

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Software Engineering

To meet requirements for the Master of Engineering majoring in Software Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

COMP5416
Advanced Network Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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, communication and security. Specialist areas such as Picture Archiving and Communication Systems (PACS), computer-aided diagnosis (CAD), 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.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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.

ELEC5618
Software Quality Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B covers the second of stage writing up and presenting the research results, and Capstone Project B extended allows the student to investigate a topic of greater depth and scope.

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.

ELEC5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5222, ELEC8902, ENGG5223, ELEC8901 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

ELEC5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ELEC8901, ELEC8902, ENGG5223, ENGG5222 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

With permission from the Head of Department candidates progressing with distinction (75%) average or higher results may replace ELEC5020, ELEC2021 and 12 cp of electives with ELEC5222 & ELEC5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

COMP5116
Design of Networks & Distributed Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit covers general foundations of communication systems and a detailed walk through of the implementation of the TCP/IP protocol stack, which forms the basis of the Internet. The unit also covers the basic knowledge of how to analyse, design and implement simple communication protocols.

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 and design.

COMP5211
Algorithms

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour lectures and one 1 hour tutorial per week. **Assumed knowledge:** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. Some knowledge of computer programming is required. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 computational thinking from simple list manipulation and data format conversion, up to shortest paths and cycle detection in graphs. Students will gain essential knowledge in computer science, including basic concepts in data structures, algorithms, and intractability, using paradigms such as dynamic programming, divide and conquer, greed, local search, and randomisation, as well NP-hardness.

COMP5347
Web Application Development

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week; Project Work - own time 3 hrs/week; Independent Study, **Assumed knowledge:** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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
Introduction to Bioinformatics

This unit of study is not available in 2015

Credit points: 6 **Session:** Summer Main **Classes:** Laboratory 2 hrs/week; Lecture 2 hrs/week. **Prohibitions:** COMP3456 **Assumed knowledge:** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit brings together a wide range of skills 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. The unit covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research. It further 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.

COMP9103
Software Development in Java

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 1 hours per week **Prohibitions:** COMP5214 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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. Students will be progressively guided in 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.

ELEC5206
Sustainable Energy Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/fortnight; Laboratory 2 hrsfortnight; Project Work - own time 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 power system both at distribution and transmission levels. 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 intelligent electricity networks and advanced energy conversion and power systems. The following topics are covered: modern power systems; distributed generation; co-generation; tri-generation; microturbines; fuel cells; renewable energy sources: solar, wind, hydro, biomass, wind turbines; photovoltaic; grid-connected power systems; stand-alone power systems.

ELEC5208
Intelligent Electricity Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs/. **Assumed knowledge:** Fundamentals of Electricity Networks, Control Systems and Telecommunications **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to give students an introduction to the planning and operation of modern electricity grids, also known as "smart" grids. Traditional power networks featured a small number of large base-load plants sending power out over transmission lines to be distributed in radial lower voltage networks to loads. In response to the need to reduce carbon impact, future networks will feature diverse generation scattered all over the network including at distribution levels. Also there will be new loads such as electric vehicles and technologies including energy storage and lower voltage power flow control devices. The operation of these new networks will be possible by much greater use of information and communication technology (ICT) and control over the information networks.

The unit will cover recent relevant developments in energy technologies as well as important components of 'smart grids' such as supervisory control and data acquisition (SCADA), substation automation, remote terminal units (RTU), sensors and intelligent electronic devices (IED). Operation of these electricity grids requires a huge amount of data gathering, communication and information processing. The unit will discuss many emerging technologies for such data, information, knowledge and decision processes including communication protocols and network layouts, networking middleware and coordinated control. Information systems and data gathering will be used to assess key performance and security indicators associated with the operation of such grids including stability, reliability and power quality.

ELEC5303
Computer Control System Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **Assessment:** Through semester assessment (44%) Final Exam (56%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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.

ELEC5514
Networked Embedded Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3305, ELEC3506, ELEC3607 and ELEC5508 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aim to teach the fundamentals concepts associated with:

oNetworked Embedded Systems, wireless sensor networks

oWireless channel propagation and radio power consumption

oWireless networks, ZigBee, Bluetooth, etc.

oSensor principle, data fusion, source detection and identification

oMultiple source detection, multiple access communications.

oNetwork topology, routing, network information theory

oDistributed source channel coding for sensor networks

oPower-aware and energy-aware communication protocols.

oDistributed embedded systems problems such as time synchronization and node localization,

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.

oAbility to identify the main issues and trade-offs in networked embedded systems.

oUnderstanding of the state-of-the-art solutions in the area

oBased on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.

oFamiliarization with a simulator platform and real hardware platforms for network embedded systems through the students involvement in project

ELEC5616
Computer and Network Security

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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.

ELEC5701
Technology Venture Creation

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Workgroup 1 hr/week. **Prohibitions:** ENGG5102 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

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.

This course is taught by instructors experienced in technology startups & venture capital. The course will include a number of guest lectures by industry.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

INFO5010
IT Advanced Topic A

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Late **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.

INFO6010
Advanced Topics in IT Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial (applied workshop) 1 hr/week; E-Learning 1 hr/week. **Prerequisites:** INFO6007, OR 3-5 years working experience in IT Project Management **Assumed knowledge:** Students are assumed to understand the role of IT projects. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the limitations of IT project management and the most promising techniques to overcome project failure. It will start by reviewing case study research showing we have reached the limits of traditional IT project management practice. The theoretical base will be completed by exploring the finding that senior management have more impact on success than traditional approaches.

Participants will be introduced to and learn to apply the most promising tools and techniques needed to govern IT projects. The topics reviewed will include:

1)strategy,

2)organisational change,

3)project sponsorship,

4)programme management,

5)performance measurement,

6)culture

7)portfolio management.

8)Relevant Australian and International Standards on IT/Project Governance and new industry methodologies around portfolio, programme and change management will be reviewed.

INFS6004
Business Transformation Projects

Credit points: 6 **Teacher/Coordinator:** Steve Elliot **Session:** Semester 1 **Classes:** 1x 3hr seminar per week **Assumed knowledge:** Understanding the major functions of a business and how those business functions interact internally and externally so the company can be competitive in the market is essential in order to critically analyse how a business can be transformed. Experience as a member of a project team is desirable. **Assessment:** individual research assignment (15%), individual problem-based assignment (35%), and group problem-based assignment (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The forces that currently drive business transformation, such as globalisation, the IT revolution and environmental sustainability, require businesses to be in a constant state of change to stay competitive in turbulent markets. However, as companies need to maintain their current revenue streams, they need to progress through a series of integrated business transformation projects. In this unit students learn how to analyse an organisation within a local and global context and develop knowledge of techniques required for managing technology-enabled business transformation projects. Topics covered include: the drivers of business transformation, managing change as a process, analysing information and processes, and planning, leading, sustaining, diffusing and learning from transformational projects.

For more information on units of study visit CUSP.

Structural Engineering

Course overview

A postgraduate major in Structural Engineering is concerned with the design of high-rise buildings, industrial complexes, bridges, stadiums, and sporting and exhibition centres.

You will gain an understanding of how forces, such as the weight of a building, its contents, and environmental loads, are resisted by and transferred through structures and buildings to the ground.

Areas of study inclue concrete structures, steel structures, numerical methods in engineering and structural dynamics.

Course requirements

To meet requirements for the Master of Engineering majoring in Structural Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- a minimum of 12 credit points of research units
- a maximum of 12 credit points of elective units.

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points of Core/Specialist/Research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Structural Engineering			
To meet requirements for the Master of Engineering majoring in Structural Engineering a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
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	**A** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis.	Semester 2
Research units			
All candidates are required to complete a minimum of 12 credit points from the following units:			
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2
CIVL5222 **Dissertation A**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
CIVL5223 **Dissertation B**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
With permission from the Program Director candidates progressing with distinction (75%) average or higher results may replace CIVL5020, CIVL52021 and 12 cp of electives with CIVL5222 & CIVL5223 Dissertation A & B.			
Elective units			
Candidates may complete a maximum of 12 credit points from the following units: Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director. Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.			
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
CIVL5266 **Steel Structures - Stability**	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis.	Semester 1
CIVL5269 **Concrete Structures - Strength & Service**	6	**P** CIVL3205 OR CIVL5507 OR CIVL9205	Semester 2
CIVL5351 **Geoenvironmental Engineering**	6		Semester 1
CIVL5452 **Foundation Engineering**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity)	Semester 1
CIVL5458 **Numerical Methods in Civil Engineering**	6		Semester 1
CIVL5665 **Advanced Water Resources Management**	6	**A** CIVL3612	Semester 2
CIVL5670 **Reservoir Stream & Coastal Eng**	6	**A** CIVL3612 and MATH2061.	Semester 1
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Structural Engineering

To meet requirements for the Master of Engineering majoring in Structural Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

CIVL5257
Concrete Structures: Prestressed

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - in class 1 hr/week; Project Work - own time 3 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

CIVL5264
Composite Steel-Concrete Structures

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students will understand the basic principles for the design of composite steel-concrete structures. In particular, they will develop an understanding of the procedures required for the design of composite beams, slabs and columns. Design guidelines will reflect requirements of the Australian Standards and international codes.

CIVL5267
Steel Structures - Advanced Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 as well as international standards, 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, AS/NZS4600, AISC-LRFD, BS5950 and GB50017 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.

CIVL5268
Structural Dynamics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis. **Assessment:** Through semester assessment (65%) Final Exam (35%) **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 (SDOF) 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 Parts4 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

* Ability to apply AS1170 Part 4 in structural design against earthquake actions

* Understanding of the fundamental concepts of earthquake engineering

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

Capstone Project 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 Capstone Project course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021) or this unit Capstone Project B extended (CIVL5022) worth 12 credit points. This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

CIVL5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

With permission from the Program Director candidates progressing with distinction (75%) average or higher results may replace CIVL5020, CIVL52021 and 12 cp of electives with CIVL5222 & CIVL5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 2 hrs/week; Lecture 1 hr/week; Tutorial 1 hr/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. **Assessment:** Through semester assessment (100%) **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/diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

CIVL5266
Steel Structures - Stability

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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.

CIVL5269
Concrete Structures - Strength & Service

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** CIVL3205 OR CIVL5507 OR CIVL9205 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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). Strut-and-tie modelling of reinforced concrete members is also described. Design guidelines will reflect requirements of the Australian Standards and Eurocodes.

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;

- ability to use strut-and-tie models of reinforced concrete behaviour.

CIVL5351
Geoenvironmental Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **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.

Learning Outcomes: 1. Analyse flow regime in soil using Darcy equation; 2. Analyse contaminant migration in soil using coupled flow and reactive diffusion advection equations; 3. Design a single or double composite landfill liner satisfying groundwater quality requirements; 4. Predict the potential for methane production in a landfill and assess the feasibility of waste-to-energy conversion; 5. Conduct research on a geoenvironmental topic as part for group.

Syllabus Summary: introduction to geoenvironmental engineering; integrated waste management and life cycle assessment; soil composition and mineralogy; types and characteristics of contaminants; theory of water seepage in soil and hydraulic conductivity; theory of reactive contaminant transport in soil including molecular diffusion, mechanical dispersion and advective flow; analytical and numerical solutions of reactive diffusion advection equation; design of landfills; geosynthetics and geomembranes; defects and leakage rates; methane generation in landfills and landfill gas management.

CIVL5452
Foundation Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 3 hrs per week, presented in 2 sessions per week for 11 weeks of semester. Tutorials 1hr per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity) **Assessment:** Through semester assessment (100%) **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.

CIVL5458
Numerical Methods in Civil Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives:

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.

CIVL5665
Advanced Water Resources Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL3612 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit of study is to introduce students and professionals to water resources engineering. The aim of this unit is to provide an understanding of: hydrologic cycle from the broadest perspective, physical, chemical and biological characterization of water, how to change the water quality parameters, water quality control and management, water quality in the environment, nutrient and contaminant cycling and removal, water treatment methods for drinking, wastewater and groundwater, conservation/reuse/treatment techniques, desalination, stormwater, bioremediation and phytoremediation techniques. The topics mentioned above will be covered in both a qualitative and quantitative aspects. A basic level of integral and differential calculus is required as well as knowledge and use of calculation software such as Excell and Matlab.

CIVL5670
Reservoir Stream & Coastal Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs/week; Tutorials 2 hrs/week. **Assumed knowledge:** CIVL3612 and MATH2061. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

(Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Sustainability and Environmental Engineering

Course overview

A postgraduate major in Sustainability and Environmental Engineering is broadly concerned with sustainability, especially energy utilisation and protection of the environment and human amenity.

You will learn about the development of sustainable products and processes that maximise resource and energy efficiency and minimise environmental impact.

Areas of study include green engineering, wastewater engineering, and sustainable design engineering and management.

Course requirements

To meet requirements for the Master of Engineering majoring in Sustainability and Environmental Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- a minimum of 12 credit points of research units
- a maximum of 12 credit points of elective units.

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points of Core/Specialist/Research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Sustainability and Environmental Engineering			
To meet requirements for the Master of Engineering majoring in Sustainability and Environmental Engineering a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
CHNG5003 **Green Engineering**	6	**A** CHNG3801 AND CHNG3802 AND CHNG3803 AND CHNG3805 AND CHNG3806 AND CHNG3807. All core third year chemical engineering.	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. *Note: Department permission required for enrolment*	Semester 1
CHNG5005 **Wastewater Engineering**	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 1
CHNG5006 **Advanced Wastewater Engineering**	6	**A** CHNG5005 OR CHNG3804.	Semester 2
CHNG5008 **Nanotechnology in Chemical Engineering**	6	**P** CHNG3801 AND CHNG3802 AND CHNG3805 AND CHNG3806 *Note: Department permission required for enrolment* *Note: School permission required for enrollment.*	Semester 2
CHNG5601 **Membrane Science**	6		Semester 1
CHNG5604 **Membrane Engineering Laboratory**	6	**A** CHNG5601	Semester 2
Research units			
All candidates are required to complete a minimum of 12 credit points from the following units:			
CHNG5020 **Capstone Project A**	6	**A** (CHNG9301 OR CHNG5801) AND (CHNG9302 OR CHNG5802) AND (CHNG9303 OR CHNG5803) AND (CHNG9305 OR CHNG5805) AND (CHNG9306 OR CHNG5806). **P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) *School permission required for enrolment in semester 2.*	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHNG5021 **Capstone Project B**	6	**A** Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. **C** CHNG5020 *School permission required for enrolment in session 1.*	Semester 1 Semester 2
CHNG5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **C** CHNG5020 *Note: Department permission required for enrolment* *Permission required for semester 1 or 2 based on achievement in Capstone Project A and taking other program requirements into consideration.*	Semester 1 Semester 2
CHNG5222 **Dissertation A**	12	**N** ENGG5221, ENGG5220 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
CHNG5223 **Dissertation B**	12	**N** ENGG5221, ENGG5220 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace AMME5020, AMME5021 and 12 cp of electives with AMME5222 & AMME5223, Dissertation A & B.			

Elective units

Candidates may complete a maximum of 12 credit points from the following units:

Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.

Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHNG5001 **Process Systems Engineering**	6	**A** First year undergraduate physics and mathematics (differential equations). Use of mathematical and/or computer-based modelling tools and techniques. Feedback control concepts and principles as taught in CHNG3802/CHNG5802 or similar courses. Students who are unsure about meeting these requirements should contact the unit coordinator for advice. *This unit of study is for Masters students and can be selected as an elective by 4th year students.*	Semester 2
CHNG5602 **Cellular Biophysics**	6	*Note: Department permission required for enrolment*	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 *This course is for Master degree students and also is offered as an elective course for fourth year students. Some lectures my be given by a guest lecturer. this*	Semester 1
CHNG5605 **Bio-Products: Laboratory to Marketplace**	6	*This course is for Master degree students and also is offered as an elective course for fourth year students. .*	Semester 2
CIVL5670 **Reservoir Stream & Coastal Eng**	6	**A** CIVL3612 and MATH2061.	Semester 1
ENGG5216 **Management of Engineering Innovation**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 1
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July
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. **P** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) *Note: Department permission required for enrolment*	Semester 2

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Sustainability and Environmental Engineering

To meet requirements for the Master of Engineering majoring in Sustainability and Environmental Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

CHNG5003
Green Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Meeting 4 hrs/week. **Assumed knowledge:** CHNG3801 AND CHNG3802 AND CHNG3803 AND CHNG3805 AND CHNG3806 AND CHNG3807. All core third year chemical engineering. **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/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. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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. This UoS is an advanced Chemical Engineering elective.

CHNG5005
Wastewater Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Group assignment 2 hrs/week; Site Visit 5 hrs/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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to acquaint students with the application of chemical engineering concepts and practice in an environmental context, the important example of wastewater treatment will be explored.

The key issues that will be considered are: Wastewater creation and characterisation; Wastewater treatment costs; Primary, secondary and tertiary treatment options; High-rate anaerobic and aerobic treatment options; Sludge management and water recovery/reuse options; Process integration considerations.

By the end of this UOS, a student should have gained an engineering-based appreciation of the technical, economic and social challenges posed by wastewater generation and its cost-effective treatment.

This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught here are relevant to the real-world practice of chemical engineering across a broad range of industries.

CHNG5006
Advanced Wastewater Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** CHNG5005 OR CHNG3804. **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study addresses inter-related issues relevant to wastewater treatment including: (i) the diverse nature of wastewater and its characteristics; (ii) an overview of conventional wastewater treatment options; (iii) the use of commercial software in designing and evaluating a range of advanced wastewater treatment options including biological nutrient removal; (iv) the potential role of constructed wetlands in domestic and industrial wastewater treatment; (v) wastewater management in the food processing, resources, and coal seam gas production industries; (vi) researching advanced wastewater treatment options.

CHNG5008
Nanotechnology in Chemical Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time 8 hrs/week; Lecture 4 hrs/week. **Prerequisites:** CHNG3801 AND CHNG3802 AND CHNG3805 AND CHNG3806 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Note: School permission required for enrollment.

This course will give students insights into advanced concepts in Chemical and Biomolecular Engineering, which are essential for the design of efficient processes and green products for the sustainable development and minimise or preferably eliminate waste for a clean world. This unit of study will examine cutting edge examples of nano-technology, renewable energy, bio-technology, and other advanced technologies across a broad range of applications relevant to chemical and biomolecular engineering. At the completion of this unit of study students should have developed an appreciation of the underlying concepts 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.

CHNG5601
Membrane Science

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 4 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

"Membrane Science" provides background in the physics and electrochemistry of a variety of synthetic membranes used in industry as well as cellular membranes.

The course aims to provide students with an understand of:

membrane self-assembly and manufacture;

membrane separation processes such as filtration, desalination, ion exchange and water-splitting;

and techniques for membrane characterisation and monitoring.

CHNG5604
Membrane Engineering Laboratory

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 4 hrs/week. **Assumed knowledge:** CHNG5601 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This a practical unit of study where students apply the theoretical concepts of membrane science to engineering practice via a series of laboratory experiments. The students will gain practical insights into mass transport processes through various membranes. Students will understand the construction and functional properties of synthetic separation membranes and also will explore experimentally the various factors affecting the performance of membranes.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

CHNG5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting 1 hr/week; Project Work - own time 5 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assumed knowledge:** (CHNG9301 OR CHNG5801) AND (CHNG9302 OR CHNG5802) AND (CHNG9303 OR CHNG5803) AND (CHNG9305 OR CHNG5805) AND (CHNG9306 OR CHNG5806). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: School permission required for enrolment in semester 2.

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 (Minimum 12 A and B) run over two semesters. 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.Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.

CHNG5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting 1 hr/week; Project Work - own time 5 hrs/week. **Corequisites:** CHNG5020 **Assumed knowledge:** Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: School permission required for enrolment in session 1.

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 (Capstone Project 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. The supervisor will be available for discussion - typically 1 hour per week.

CHNG5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** No formal classes **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Corequisites:** CHNG5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: Permission required for semester 1 or 2 based on achievement in Capstone Project A and taking other program requirements into consideration.

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 (Capstone Project A and B/B extended) 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 Capstone Project A will be evaluated based on a seminar presentation and a progress report. The skills acquired will be invaluable to students undertaking engineering work.Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week. Capstone Project B extended enables the student to undertake a project of greater scope and depth than capstone project B.

CHNG5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5221, ENGG5220 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 &2

CHNG5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5221, ENGG5220 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 insessions 1 & 2

With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace

AMME5020, AMME5021 and 12 cp of electives with AMME5222 & AMME5223, Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

CHNG5001
Process Systems Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Project Work - in class 2 hrs/week; Project Work - own time 4 hrs/week. **Assumed knowledge:** First year undergraduate physics and mathematics (differential equations). Use of mathematical and/or computer-based modelling tools and techniques. Feedback control concepts and principles as taught in CHNG3802/CHNG5802 or similar courses. Students who are unsure about meeting these requirements should contact the unit coordinator for advice. **Assessment:** Through semester assessment (100%) **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.

CHNG5602
Cellular Biophysics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 4 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Project Work - own time 2 hrs/week. **Assumed knowledge:** It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This course is for Master degree students and also is offered as an elective course for fourth year students. Some lectures my be given by a guest lecturer. this

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.

CHNG5605
Bio-Products: Laboratory to Marketplace

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Project Work - own time 6 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This course is for Master degree students and also is offered as an elective course for fourth year students. .

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.This unit of study is offered as an advanced elective unit of study to final year undergraduate students. Students may be required to attend lectures off-campus.

CIVL5670
Reservoir Stream & Coastal Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs/week; Tutorials 2 hrs/week. **Assumed knowledge:** CIVL3612 and MATH2061. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

(Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)

ENGG5216
Management of Engineering Innovation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Presentation 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

MECH5275
Advanced Renewable Energy

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) **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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

For more information on units of study visit CUSP.

Telecommunications Engineering

Course overview

A postgraduate major in Telecommunications Engineering will provide you with advanced skills in the design, build and management of systems that carry out the transmission and broadcasting of information using wireless signals.

Areas of study include radio frequency engineering, mobile networks, gigabits wireless systems, and satellite communication systems.

Course requirements

To meet requirements for the Master of Engineering majoring in Telecommunications Engineering a candidate will complete 72 credit points as listed in the unit of study table including:

- 24 credit points of core units
- 24 credit points of specialist units
- a minimum of 12 credit points of research units
- a maximum of 12 credit points of elective units.

Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points of Core/Specialist/Research units with a balance such that there is:

- a minimum of 12 credit points of core units
- a minimum of 12 credit points of specialist units, and
- a minimum of 12 credit points of research units.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Engineering majoring in Telecommunications Engineering			
To meet requirements for the Master of Engineering majoring in Telecommunications Engineering a candidate will complete 72 credit points as listed in the unit of study table including: (a) 24 credit points of Core units (b) 24 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including: (a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units (c) A minimum of 12 credit points of Research units (d) Elective units are not available for candidates with RVL			
Core units			
Candidates must complete 24 credit points of Core units. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.			
ENGG5102 **Entrepreneurship for Engineers**	6	**A** Some limited industry experience is preferred but not a must. **N** ELEC5701	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
Specialist units			
Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives. Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units. Exchange units may be taken as Specialist units with the approval of the Program Director.			
ELEC5101 **Antennas and Propagation**	6		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.	Semester 1
ELEC5507 **Error Control Coding**	6	**A** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired.	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
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.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	Semester 2
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3305, ELEC3506, ELEC3607 and ELEC5508	Semester 2
ELEC5516 **Electrical and Optical Sensor Design**	6	**A** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis	Semester 1
Research units			
All candidates are required to complete a minimum of 12 credit points from the following units:			
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
ELEC5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption *Note: Department permission required for enrolment*	Semester 1 Semester 2
ELEC5222 **Dissertation A**	12	**N** ENGG5222, ELEC8902, ENGG5223, ELEC8901 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
ELEC5223 **Dissertation B**	12	**N** ELEC8901, ELEC8902, ENGG5223, ENGG5222 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

With permission from the Head of Department candidates progressing with distinction (75%) average or higher results may replace ELEC5020, ELEC2021 and 12 cp of electives with ELEC5222 & ELEC5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:

Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.

Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	Semester 1
ELEC5203 **Topics in Power Engineering**	6	**A** ELEC3203 Power Engineering and ELEC3204 Power Electronics and Drives.Familiarity with basic mathematics and physics; competence with basic circuit theory and understanding of electricity grid equipment such as transformers, transmission lines and associated modeling; and fundamentals of power electronic technologies.	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.	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. **P** ELEC3203 OR ELEC9203	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
ELEC5207 **Advanced Power Conversion Technologies**	6	**A** ELEC3204	Semester 2
ELEC5208 **Intelligent Electricity Networks**	6	**A** Fundamentals of Electricity Networks, Control Systems and Telecommunications	Semester 1
ELEC5211 **Power Systems Dynamics and Control**	6	**A** The pre-required knowledge for learning this UoS is a deep understanding on circuit analysis and its applications in power system steady state analysis. **P** ELEC3203 OR ELEC9203 OR ELEC5732	Semester 1
ELEC5212 **Power Systems Planning and Markets**	6	**A** The pre-required knowledge for learning this UoS is power system steady state analysis **P** ELEC3203 OR ELEC9203	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. *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) **N** MECH5701	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC5803 **Advanced Bioelectronics**	6	**A** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **P** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) *Note: Department permission required for enrolment*	Semester 1
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Engineering majoring in Telecommunications Engineering

To meet requirements for the Master of Engineering majoring in Telecommunications Engineering a candidate will complete 72 credit points as listed in the unit of study table including:(a) 24 credit points of Core units (b) 24 credit points of Specialist units(c) A minimum of 12 credit points of Research units (d) A maximum of 12 credit points of Elective units Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:(a) A minimum of 12 credit points of Core units (b) A minimum of 12 credit points of Specialist units(c) A minimum of 12 credit points of Research units(d) Elective units are not available for candidates with RVL

Core units

Candidates must complete 24 credit points of Core units.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Core units.

ENGG5102
Entrepreneurship for Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prohibitions:** ELEC5701 **Assumed knowledge:** Some limited industry experience is preferred but not a must. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce graduate engineering students from all disciplines to the concepts and practices of entrepreneurial thinking. Introduction to Entrepreneurship will offer the foundation for leaders of tomorrow's high-tech companies, by providing the knowledge and skills important to the creation and leadership of entrepreneurial ventures. The focus of the unit of study is on how to launch, lead and manage a viable business starting with concept validation to commercialisation and successful business formation.

The following topics are covered: Entrepreneurship: Turning Ideas into Reality, Building the Business Plan, Creating a Successful Financial Plan, Project planning and resource management, Budgeting and managing cash flow, Marketing and advertising strategies, E-Commerce and Entrepreneurship, Procurement Management Strategies, The Legal Environment: Business Law and Government Regulation, Intellectual property: inventions, patents and copyright, Workplace, workforce and employment topics, Conflict resolution and working relationships, Ethics and Social Responsibility.

Assumed knowledge: Some limited industry experience is preferred but not a must.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

Specialist units

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.Where Reduced Volume Learning has been granted candidates must complete a minimum of 12 credit points of Specialist units.Exchange units may be taken as Specialist units with the approval of the Program Director.

ELEC5101
Antennas and Propagation

Credit points: 6 **Session:** Semester 2 **Classes:** Laboratory 3 hrs/week; Lecture 2 hrs/week; Independent Study, **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The basics of antenna radiation are introduced with emphasis on the important performance characteristics of the radiation field pattern (in 3 dimensions) and feed impedance. The omnidirectional and Hertzian dipole antennas (both hypothetical in practise but robust theoretically) provide the starting point to analyse real antenna operation. Mutual coupling between close antennas and important 'ground' imaging effects lead to the design of antenna arrays to increase gain and directivity. Aperture antennas and frequency broadbanding techniques are introduced. Ionospheric propagation is discussed and also the the reception efficiency of receiving antennas which allows consideration of a Transmitter - Receiver 'Link budget'. The important 'Pocklington' equation for a wire dipole is developed from Maxwell's equations and leads to the numerical analysis of wire antennas using 'Moment' methods. Real world applications are emphasised throughout and are reinforced by the hands on laboratory program which includes design projects.

ELEC5403
Radio Frequency Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorial 2 hrs/week; Lecture 2 hrs/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:**

Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3305, ELEC3506, ELEC3607 and ELEC5508 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aim to teach the fundamentals concepts associated with:

oNetworked Embedded Systems, wireless sensor networks

oWireless channel propagation and radio power consumption

oWireless networks, ZigBee, Bluetooth, etc.

oSensor principle, data fusion, source detection and identification

oMultiple source detection, multiple access communications.

oNetwork topology, routing, network information theory

oDistributed source channel coding for sensor networks

oPower-aware and energy-aware communication protocols.

oDistributed embedded systems problems such as time synchronization and node localization,

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.

oAbility to identify the main issues and trade-offs in networked embedded systems.

oUnderstanding of the state-of-the-art solutions in the area

oBased on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.

oFamiliarization with a simulator platform and real hardware platforms for network embedded systems through the students involvement in project

ELEC5516
Electrical and Optical Sensor Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hours per week; Tutorial 1 hour per week; E-Learning 1 hour per week; Laboratory: 8 hours overall. **Assumed knowledge:** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The course focuses on environmentally friendly, intelligent sensors for multiple parameters monitoring to be used in power network and broadband network. The concepts learnt in this unit will be heavily used in various engineering applications in power systems, fiber optic systems and health monitoring. These concepts include:

-Theory, design and applications of optical fiber sensors.

-Sensor technologies for the growth of smart grid in power engineering.

-Actuators and motors for electrical sensor and its applications.

-Wearable sensor technologies for ehealth monitoring.

Research units

All candidates are required to complete a minimum of 12 credit points from the following units:

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B covers the second of stage writing up and presenting the research results, and Capstone Project B extended allows the student to investigate a topic of greater depth and scope.

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.

ELEC5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5222, ELEC8902, ENGG5223, ELEC8901 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

ELEC5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ELEC8901, ELEC8902, ENGG5223, ENGG5222 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

With permission from the Head of Department candidates progressing with distinction (75%) average or higher results may replace ELEC5020, ELEC2021 and 12 cp of electives with ELEC5222 & ELEC5223 Dissertation A & B.

Elective units

Candidates may complete a maximum of 12 credit points from the following units:Specialist units may also be taken as Elective units. Other Postgraduate units in the Faculty may be taken as Elective units with the approval of the Program Director.Electives may be approved for candidates who have been granted RVL with the approval of the Program Director.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

COMP5416
Advanced Network Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

ELEC5203
Topics in Power Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial-Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3203 Power Engineering and ELEC3204 Power Electronics and Drives.Familiarity with basic mathematics and physics; competence with basic circuit theory and understanding of electricity grid equipment such as transformers, transmission lines and associated modeling; and fundamentals of power electronic technologies. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides the basis for the analysis of electricity grids using symmetrical components theory. Such analysis theory is the basis for the understanding of electrical faults and the design of protection strategies to safeguard the electrical equipment, and maintain safety of the plant at the highest possible level.

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:** Lecture 2 hrs/week; Tutorial - Laboratory 2 hrs/week; Project Work - in class 2 hrs. **Prerequisites:** ELEC3203 OR ELEC9203 **Assumed knowledge:** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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:** Lecture 2 hrs/week; Tutorial 2 hrs/fortnight; Laboratory 2 hrsfortnight; Project Work - own time 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 power system both at distribution and transmission levels. 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 intelligent electricity networks and advanced energy conversion and power systems. The following topics are covered: modern power systems; distributed generation; co-generation; tri-generation; microturbines; fuel cells; renewable energy sources: solar, wind, hydro, biomass, wind turbines; photovoltaic; grid-connected power systems; stand-alone power systems.

ELEC5207
Advanced Power Conversion Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial - Laboratory 3 hrs/week; Project Work - own time 2 hrs/week. **Assumed knowledge:** ELEC3204 **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to cover advanced topics in power electronics and it applications. In particular, the power electronics interface design and implementation for microgrid, smart grids and modern power systems which have received tremendous attention in recent years. Many countries including Australia are developing different power electronics technologies such as integrating renewable energy sources into the grid, managing charging and discharging of high power energy storage system, controlling the reactive power of power electronics interfaces for grid stability, and adding communication capability to power electronics interfaces for smart meter implementation. The unit assumes prior fundamental knowledge of power electronics systems and applications, including the ability to analyse basic power converters for all four conversions (ac-ac, ac-dc, dc-ac, and ac-dc), and design and implement various applications, such as motor drive and battery charger, with the consideration of electrical characteristics of semiconductors and passive elements. This unit will cover advanced technologies on power electronics interfaces for smart grids and microgrid implementation, which include dynamic voltage restorer, active power filter, reactive power compensation, energy storage management, hybrid energy sources optimisation, multilevel inverter and control, D-STATCOM, etc. To analyse these advanced power conversion systems, some analytical techniques will be introduced. This includes resonant converters, soft-switching technique, ac equivalent circuit modeling, converter control and input/output filter design.

ELEC5208
Intelligent Electricity Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs/. **Assumed knowledge:** Fundamentals of Electricity Networks, Control Systems and Telecommunications **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to give students an introduction to the planning and operation of modern electricity grids, also known as "smart" grids. Traditional power networks featured a small number of large base-load plants sending power out over transmission lines to be distributed in radial lower voltage networks to loads. In response to the need to reduce carbon impact, future networks will feature diverse generation scattered all over the network including at distribution levels. Also there will be new loads such as electric vehicles and technologies including energy storage and lower voltage power flow control devices. The operation of these new networks will be possible by much greater use of information and communication technology (ICT) and control over the information networks.

The unit will cover recent relevant developments in energy technologies as well as important components of 'smart grids' such as supervisory control and data acquisition (SCADA), substation automation, remote terminal units (RTU), sensors and intelligent electronic devices (IED). Operation of these electricity grids requires a huge amount of data gathering, communication and information processing. The unit will discuss many emerging technologies for such data, information, knowledge and decision processes including communication protocols and network layouts, networking middleware and coordinated control. Information systems and data gathering will be used to assess key performance and security indicators associated with the operation of such grids including stability, reliability and power quality.

ELEC5211
Power Systems Dynamics and Control

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** ELEC3203 OR ELEC9203 OR ELEC5732 **Assumed knowledge:** The pre-required knowledge for learning this UoS is a deep understanding on circuit analysis and its applications in power system steady state analysis. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit deals with power systems modelling, analysis and simulation under dynamic conditions. The unit will cover the following topics:

- The links between power system steady state analysis and transient analysis

- Basics of dynamic system in general and stability analysis methods;

- Analysis of power systems subject to electromagnetic and electromechanical transients

- Power system modelling for stability analysis and electromagnetic transients analysis: Synchronous machine modelling using Park's transformation; Modelling of excitation systems and turbine governors; Modelling of the transmission system; Load modelling.

- Simulation of interconnected multi-machine systems

- Stability analysis: Transient stability; Small signal stability; Voltage stability;

- Power system control: Voltage control; Power system transient stability control; Power system dynamic stability control; Emergency control.

The unit is a specialist Unit for MPE (Power) and ME (Electrical and Power). It is also available as a recommended elective for BE Electrical (Power).

ELEC5212
Power Systems Planning and Markets

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/fortnight. **Prerequisites:** ELEC3203 OR ELEC9203 **Assumed knowledge:** The pre-required knowledge for learning this UoS is power system steady state analysis **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Deregulation of the electricity industry has fundamentally changed the power systems operation paradigm. The focus has shifted from central planning of vertically integrated utilities to market driven operation. Traditional electric energy producers and consumers play new roles in a power market environment and their behaviors are affected by the economic incentives to a large extent. Nevertheless, electric energy is a special commodity and cannot be traded as the other common goods. So a power market design has many special considerations compared with a conventional commercial market design. Knowledge of the power market mechanisms has become a necessary part in fully understanding the whole power system operations. To equip students with necessary skills to address the challenges of modern power systems, the unit will cover the following topics:

- Overview of the traditional electricity industry structure and operation: Economic dispatch, Power system operation states and respective reliability requirements.

- Drivers for the restructuring of the electricity industry.

- Electricity market design: Market structures (spot, bilateral, hybrid) ; Energy market; Ancillary services market; Key components in an electricity market;

- Electricity market participants and their roles in a market.

- Electricity economics: Power market from suppliers' view (Supply curve) and from demands' view (Demand curve); Market mechanism; Price and its elasticity; Cost and supply; Market power and monopoly.

- Cost of capital: Time value of money; Project evaluation methods from investments' point of view; Risk and return;

- Operation mechanisms of various designs of power markets;

- Power market practices around the world;

- Power system expansion planning: Fundamental knowledge of power system planning considerations, procedures and methods; Transmission planning; Generation planning; Power system adequacy assessment.

ELEC5212 is a specialist Unit for MPE (Power) and ME (Electrical and Power). It is also available as a recommended elective for BE Electrical (Power). This unit focuses on the power market principles and practices. Based on the knowledge of the power market operation, the power system planning procedures and methods will also be discussed.

ELEC5303
Computer Control System Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **Assessment:** Through semester assessment (44%) Final Exam (56%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

ELEC5803
Advanced Bioelectronics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) **Assumed knowledge:** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will cover advanced topics in the application of electronics and signal processing to physiological monitoring, biosensors, electrical stimulation and medical imaging. Electrical safety and regulations of medical devices in Australia will be introduced. Guest lectures will describe the different needs and requirements in several clinical areas including neonatal care, oncology, cardiology and neurology.

Assumed Knowledge: A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Master of Professional Engineering

Course overview

The Master of Professional Engineering will provide you with the engineering professional practice and research skills that will allow you to be recognised as an Australian graduate engineer.

It will help you develop the sound communication, management and judgement capability necessary to interpret and discuss issues involving significant complexity in your area of specialisation.

Course structure

The degree is comprised of foundation units of study, core units in an area of specialisation and a 12-week practical experience component.

There are also a number of professional electives to choose from and a capstone project in your final year.

An expanded research dissertation is available to who students achieve a distinction average results.

Accreditation

The programs in Chemical and Biomolecular, Civil, Electrical, Mechanical, Power and Structural Engineering have been awarded full accreditation by Engineers Australia, the national accreditation body.

The specialisations in Aerospace, Biomedical, Fluids, Geomechanical, Software and Telecommunications have provisional accreditation until the required numbers of students have graduated.

In addition, our graduates are recognised internationally through the Washington Accord of the International Engineering Alliance.

Master of Professional Engineering

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
MAPROFEN-02	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 Specialisations

(1) The Master of Professional Engineering is available in the following specialisations:
(a) Aerospace Engineering
(b) Biomedical Engineering
(c) Chemical & Biomolecular Engineering
(d) Civil Engineering
(e) Electrical Engineering
(f) Fluids Engineering
(g) Geomechanical Engineering
(h) Mechanical Engineering
(i) Power Engineering
(j) Software Engineering
(k) Structural Engineering
(l) Telecommunications Engineering
(2) Completion of a specialisation is a requirement of the course. Candidates wishing to transfer between specialisations 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 48 credit points in total, which, in the estimation of the Dean, is comparable to the requirements for the first year of a Bachelor of Engineering at this University in the stream sought for admission.
(4) 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 144 credit points, including core and elective units of study as listed in the table of units of study for each specialisation.

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 Dean.
(2) A maximum of 72 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 Dean and are equivalent to units of study offered in the Master of Professional Engineering.
(3) Candidates with a Bachelor of Engineering or equivalent in the relevant discipline and who have reached an acceptable level academic achievement in their prior degree may be eligible for a reduction of volume in learning of up to 48 credit points.
(4) Candidates with a Bachelor of Applied Science or equivalent in a field suitable to the faculty, or a Bachelor of Engineering or equivalent in another field, may be eligible for a reduction of volume in learning of up to 24 credit points.

8 Progression

(1) Candidates are required to meet the progression requirements as specified in the Coursework Rule, and

9 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2015 and students who commenced their candidature prior to 1 January, 2015 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2015 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Aerospace Engineering

Course overview

Aerospace Engineering is the study of the mathematics, physics, computer science, material science and design philosophy underlying the analysis, design, manufacture and operation of aerospace vehicles.

Areas of study include spacecraft and satellite design, aerodynamics, aircraft design analysis, and smart materials.

This degree has been given provisional accreditation at the level of Professional Engineering by the industry governing body,Engineers Australia.

Course requirements

Candidates for the Master of Professional Engineering (Aerospace) complete 144 credit points as listed in the unit of study table.

They also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Aerospace)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One			
Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
AMME9261 **Fluid Mechanics 1**	6	**A** Students are expected to be familiar with first year basic maths: integral calculus, differential calculus and linear algebra. **N** AMME5200	Semester 1
AMME9500 **Engineering Dynamics**	6	**A** Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **N** AMME5500	Semester 1
AMME9700 **Instrumentation**	6	**A** Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. **N** AMME5700	Semester 1
ENGG9801 **Engineering Computing**	6	**N** ENGG5801	Semester 1
Year One - Semester Two			
AMME9262 **Thermal Engineering 1**	6	**A** Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra. **N** AMME9200 OR AMME5200.	Semester 2
AMME9301 **Mechanics of Solids 1**	6	**A** Physics, statics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **N** AMME5301	Semester 2
AMME9302 **Materials 1**	6	**N** : AMME5302 OR CIVL5501	Semester 1 Semester 2
MECH9400 **Mechanical Design 1**	6	**A** Knowledge of programming in MATLAB and a knowledge of Engineering Mechanics (statics) **N** MECH5400	Semester 2
Year Two - Semester One			
AERO9360 **Aerospace Structures 1**	6	**P** AMME9301 **N** AERO5310	Semester 1
AERO9460 **Aerospace Design 1**	6	**P** MECH9400 OR MECH5400 **N** AERO5410	Semester 1
AERO9560 **Flight Mechanics 1**	6	**A** Mathematics, Physics and Dynamics assumed knowledge at the level of Bachelor of Science or equivalent. **P** AMME9500 OR AMME5500 **N** AERO5510	Semester 1
AMME9501 **System Dynamics and Control**	6	**A** AMME5500 OR AMME9500 **N** AMME5501	Semester 1
Year Two - Semester Two			
AERO9260 **Aerodynamics 1**	6	**A** Mathematics and Physics to the level of Bachelor of Science or equivalent. Linear Mathematics and Vector Calculus, Partial Differential Equations (Intro). **P** AMME9261 or AMME5200	Semester 2
AERO9261 **Propulsion**	6	**A** Mathematics and Physics to a level of Bachelor of Science or equivalent. Good knowledge of fluid dynamics and thermodynamics. **P** (AMME9261 AND AMME9262) OR AMME5200 **N** AERO5211	Semester 2
Select 12 credit points from Aerospace recommended electives block.			
Year Three - Semester One			
AERO9301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field. **P** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **N** AERO5301	Semester 1
AMME5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study).	Semester 1 Semester 2
AMME9601 **Professional Engineering**	6	**A** Experience in a professional engineering related field is desirable to aid in group tutorial discussion. **N** AMME5601	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5020 and 6cp of recommended electives with AMME5222 Dissertation A.			
Select 6 credit points from Aerospace recommended electives block.			
Year Three - Semester Two			
AERO5400 **Advanced Aircraft Design Analysis**	6	**A** (AERO1400, AERO3260, AERO3261, AERO3360, AERO3465, AERO3560, AERO4460) or equivalent. **P** AERO3460 OR AERO5410 OR AERO9460 **N** : AERO4491	Semester 2
AMME5021 **Capstone Project B**	6	**C** AMME5020	Semester 1 Semester 2
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5021 and 6cp of recommended electives with AMME5223 Dissertation B.			
Select 6 credit points from Aerospace recommended electives block.			
Elective units 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. *Note: Department permission required for enrolment* *Department Permission required for Enrolment*	Semester 2
AERO5200 **Advanced Aerodynamics**	6	**A** BE in the area of Aerospace Engineering or related Engineering field. **P** AERO5210 OR AERO9260 OR AERO3260 *Note: Department permission required for enrolment*	Semester 1
AERO5500 **Flight Mechanics Test and Evaluation Adv**	6	**A** BE in the area of Aerospace Engineering or related Engineering field. **P** AERO5510 OR AERO9560 OR AERO3560	Semester 2
AERO5520 **Aircraft Avionics and Systems** *This unit of study is not available in 2015*	6	**P** AERO5510 or AERO3560 *Note: Department permission required for enrolment*	Semester 2
AERO5700 **Space Engineering (Advanced)**	6	**A** AERO3760	Semester 2
AERO5750 **Unmanned Air Vehicle Systems**	6	**A** AERO1560, AERO1400, AMME2700, AERO3460, AERO3560, AERO3260, AERO3261, AERO4460, or equivalent units.	Semester 2
AERO9760 **Spacecraft and Satellite Design**	6	**N** AERO5760	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
AMME5310 **Engineering Tribology**	6	**A** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261)	Semester 1
AMME5510 **Vibration and Acoustics**	6	**A** (AMME2301 OR AMME9301) AND AMME2200 AND (AMME2500 OR AMME9500) *Note: Department permission required for enrolment*	Semester 2
AMME5520 **Advanced Control and Optimisation**	6	**A** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **P** AMME3500 OR AMME5501 OR AMME9501	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	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. **P** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) *Note: Department permission required for enrolment*	Semester 2
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 *Note: Department permission required for enrolment* *Students will attend a series lectures on failure analyses of engineering materials addressing brittle rupture/fracture, yielding, cleavage fracture, fatigue and creep failure of engineering materials under static and dynamic loads. Students will also attend short introduction courses on optical microscopy and scanning electron microscopy (SEM) to gain some essential knowledge in diagnostic and forensic analyses of materials failure. Each student participates in a couple of group projects relevant to diagnostic analyses of failure of typical engineering materials such as steel, aluminium, magnesium alloys, engineering plastics and advanced fibre composites. Under the guidance of the supervisor, the student will learn how to initiate a proposal on failure analysis, how to do the project investigation and how to prepare and carry out technical communications (oral presentation and discussion between groups). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
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 *The UoS covers the key knowledge of most smart materials such as dielectric, piezoelectric, magneto-electric and shape memory materials. Each student participates in a couple of group projects relevant to characterization of structure-property relationship of functional structures with desired performance. Under the guidance of the supervisor, the student will learn how to develop a proposal, how to do the project investigation and how to prepare and carry out the technical communications (writing and oral). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.*	Semester 2
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310 *Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.*	Semester 1
Project units			
All candidates are required to complete a minimum of 12 credit points of Project units. Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. Extended Capstone Project candidates take Capstone Project units AMME5020 and AMME5022 (total 18 cp) in place of Capstone Project AMME5021 and 6 cp of elective units.			
AMME5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study).	Semester 1 Semester 2
AMME5021 **Capstone Project B**	6	**C** AMME5020	Semester 1 Semester 2
AMME5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2
Research pathway			
Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway. Research pathway candidates take Dissertation units AMME5222 and AMME5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.			
AMME5222 **Dissertation A**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2
AMME5223 **Dissertation B**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2
Exchange units			
Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements of the degree.			
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Aerospace)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

AMME9261
Fluid Mechanics 1

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 3 hours per week; Tutorial: 2 hours per week; Laboratory: 6 hours overall. **Prohibitions:** AMME5200 **Assumed knowledge:** Students are expected to be familiar with first year basic maths: integral calculus, differential calculus and linear algebra. **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the fundamentals of fluid statics and fluid dynamics. At the end of this unit students will have: an understanding of the basic equations governing the statics and dynamics of fluids; the ability to analyze and determine the forces applied by a 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 basic concepts of viscosity, density, continuum, pressure, force, buoyancy, acceleration, continuity, conservation of momentum, streamlines, Bernoulli equation, Euler equation, Navier-Stokes equation. Experiments will introduce flow measuring devices and flow observation.

AMME9500
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. **Prohibitions:** AMME5500 **Assumed knowledge:** Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

AMME9700
Instrumentation

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hrs of lectures per week, 1hr of tutorials per week, 6 hrs of laboratory work per semester. **Prohibitions:** AMME5700 **Assumed knowledge:** Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to develop in students an understanding of the engineering measurements and instrumentation systems. The students will acquire an ability to make accurate and meaningful measurements. It will cover the general areas of electrical circuits and mechanical/electronic instrumentation for strain, force, pressure, moment, torque, displacement, velocity, acceleration, temperature and so on.

ENGG9801
Engineering Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week **Prohibitions:** ENGG5801 **Assessment:** Through semester assessment (50%), Final Exam (50%) **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. There will be a major project which uses programming to solve a real world engineering problem. 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.

Year One - Semester Two

AMME9262
Thermal Engineering 1

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 2 hours per week; Laboratory: 12 hours overall. **Prohibitions:** AMME9200 OR AMME5200. **Assumed knowledge:** Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra. **Assessment:** Through semester assessment (50%), Final Exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to teach the basic laws of thermodynamics and heat transfer. At the end of this unit students will have: an understanding of the basic laws of thermodynamics and heat transfer; The ability to analyze the thermodynamics of a simple open or closed engineering system. The basic knowledge to analyse and design 1D thermal circuits. 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, heat transfer by conduction,

convection and radiation, 1D thermal circuits and transient heat transfer.

AMME9301
Mechanics of Solids 1

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 3 hours per week; Tutorials: 2 hours per week **Prohibitions:** AMME5301 **Assumed knowledge:** Physics, statics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **Assessment:** Through semester assessment (35%), Final Exam (65%) **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.

AMME9302
Materials 1

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lectures : 3 hours per week; Tutorials : 2 hours per week; Laboratory: one 3 hour session. **Prohibitions:** : AMME5302 OR CIVL5501 **Assessment:** Through semester assessment (46%), Final Exam (54%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit 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.

MECH9400
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:** MECH5400 **Assumed knowledge:** Knowledge of programming in MATLAB and a knowledge of Engineering Mechanics (statics) **Assessment:** Through semester assessment (100%) **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. the efficient use of a CAD package
3. creativity,
4. the design process,
5. methods used to analyse designs.
6. Standard components

Year Two - Semester One

AERO9360
Aerospace Structures 1

Credit points: 6 **Session:** Semester 1 **Classes:** 3hrs of lectures per week and 2hrs tutorial per week **Prerequisites:** AMME9301 **Prohibitions:** AERO5310 **Assessment:** Through semester assessment (45%), final exam (55%) **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.

AERO9460
Aerospace Design 1

Credit points: 6 **Session:** Semester 1 **Classes:** Two 1hr lectures and one 3hr project class per week. **Prerequisites:** MECH9400 OR MECH5400 **Prohibitions:** AERO5410 **Assessment:** Through semester assessment (100%) **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.

AERO9560
Flight Mechanics 1

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory(2.00 hours per week), Lecture(3.00 hours per week), Tutorial(2.00 hours per week), **Prerequisites:** AMME9500 OR AMME5500 **Prohibitions:** AERO5510 **Assumed knowledge:** Mathematics, Physics and Dynamics assumed knowledge at the level of Bachelor of Science or equivalent. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

AMME9501
System Dynamics and Control

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures : 2 hours per week; Tutorials : 3 hours per week **Prohibitions:** AMME5501 **Assumed knowledge:** AMME5500 OR AMME9500 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

Year Two - Semester Two

AERO9260
Aerodynamics 1

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 **Prerequisites:** AMME9261 or AMME5200 **Assumed knowledge:** Mathematics and Physics to the level of Bachelor of Science or equivalent. Linear Mathematics and Vector Calculus, Partial Differential Equations (Intro). **Assessment:** Through semester assessment(40%), Final Exam (60%) **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; calcualtion 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.

AERO9261
Propulsion

Credit points: 6 **Session:** Semester 2 **Classes:** Three 1hr lectures and one 2hr tutorial per week **Prerequisites:** (AMME9261 AND AMME9262) OR AMME5200 **Prohibitions:** AERO5211 **Assumed knowledge:** Mathematics and Physics to a level of Bachelor of Science or equivalent. Good knowledge of fluid dynamics and thermodynamics. **Assessment:** Through semester assessment (55%), Final Exam (45%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to develop and understanding of aircraft propulsion systems. Students will learn to solve problems related to the analysis and selection of various propulsion systems in use - propellers, gas turbines, 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. Future directions; minimisation of noise and pollution; scram-jets; hybrid engines.

Select 12 credit points from Aerospace recommended electives block.

Year Three - Semester One

AERO9301
Applied Finite Element Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** 2.5 hours of lectures and 2 hours of workgroup session per week **Prerequisites:** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **Prohibitions:** AERO5301 **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (55%), Final Exam (45%) **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.

AMME5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME9601
Professional Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs per week and tutorials 2 hrs per week **Prohibitions:** AMME5601 **Assumed knowledge:** Experience in a professional engineering related field is desirable to aid in group tutorial discussion. **Assessment:** Through semester assessment (100%) **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). 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.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5020 and 6cp of recommended electives with AMME5222 Dissertation A.

Select 6 credit points from Aerospace recommended electives block.

Year Three - Semester Two

AERO5400
Advanced Aircraft Design Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Lecture 2 hrs/week; Meeting 2 hrs/week. **Prerequisites:** AERO3460 OR AERO5410 OR AERO9460 **Prohibitions:** : AERO4491 **Assumed knowledge:** (AERO1400, AERO3260, AERO3261, AERO3360, AERO3465, AERO3560, AERO4460) or equivalent. **Assessment:** Through semester assessment (100%) **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.

AMME5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Corequisites:** AMME5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5021 and 6cp of recommended electives with AMME5223 Dissertation B.

Select 6 credit points from Aerospace recommended electives block.

Elective units

Candidates must complete 24 credit points from the following Aerospace elective units.

AERO5010
Optimisation Methods in Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time 10 hrs/week. **Assumed knowledge:** BE in the area of Aerospace or related Engineering field. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Department Permission required for Enrolment

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.

Note: Department Permission required for enrolment

AERO5200
Advanced Aerodynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** AERO5210 OR AERO9260 OR AERO3260 **Assumed knowledge:** BE in the area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (100%) **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 and aerodynamics. The develop familiarity with the techniques for predicting airflow/structure interactions for aerospace vehicles.

Syllabus Summary:

(a) Advanced two and three dimensional panel method techniques; calculation of oscillatory flow results; prediction of aerodynamic derivatives. Pressure distributions for complete aircraft configuration. Unsteady subsonic flow analysis of aircraft; calculation of structural modes. Structural response to gusts; aeroelasticity; flutter and divergence. Solution of aerospace flow problems using finite element methods.

(b) Unsteady supersonic one-dimensional flow. Hypersonic flow; real gas effects. Introduction to the use of CFD for transonic flow.

(c) Rarefied gas dynamics. Direct simulation method (DSMC); near-continuum solutions. Simulation techniques for numerical solutions of non-linear continuum flow.

AERO5500
Flight Mechanics Test and Evaluation Adv

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 3 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** AERO5510 OR AERO9560 OR AERO3560 **Assumed knowledge:** BE in the area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (100%) **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.

AERO5520
Aircraft Avionics and Systems

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 3 hrs/week; Workgroup 2 hrs/week; Laboratory 2 hrs/week; Site Visit 5 hrs/week; Demonstration 2 hrs/week. **Prerequisites:** AERO5510 or AERO3560 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit of study aims to develop a thorough qualitative understanding of modern avionics and aircraft systems. It deals with the full breadth of cockpit avionics systems and subsystems from flight instrument and display technology to flight management, flight control, navigation and sensor systems.

At the end of this unit students will be able to understand the following: the principles of modern cockpit display technologies and the information they portray; the functions of flight control and navigation systems and their interactions with actuation and other aircraft systems; engine management systems; communication systems; payload sensor systems; the interactions of avionics components with power, hydraulic, bus and communication systems together with their underlying physical principles; the principles of avionics system requirements, specification , design, regulation and certification; fault tolerance and redundancy; software engineering and system integration.

AERO5700
Space Engineering (Advanced)

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** AERO3760 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Planetary observation using robotics and intelligents systems will grow in importance over the next decade. These systems can take the form of either intelligent spacecraft, robotic air vehicles or planetary rovers. In this subject we will study a wide range of robotic spacecraft systems that are used for planetary observation and focus on their specifications as well as their internal systems. From a practical perspective will be working hands on with the Mars Rover developed at the University of Sydney to study the various intelligent components and how they come together.

AERO5750
Unmanned Air Vehicle Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hours per week; Tutorial 3 hours per week. **Assumed knowledge:** AERO1560, AERO1400, AMME2700, AERO3460, AERO3560, AERO3260, AERO3261, AERO4460, or equivalent units. **Assessment:** Through-semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives/Expected Outcomes: To develop specialist knowledge and understanding of Unmanned Air Vehicle (UAV) systems. To be able to assess, evaluate and perform preliminary design analysis on complete UAV systems.

Syllabus summary: This course will focus on understanding UAVs from a system perspective. It will consider a variety of key UAV subsystems and look at how these interact to determine the overall effectiveness of a particular UAV system for a given mission. Based on this understanding it will also look at the evaluation and design of a complete UAV system for a given mission specification. Some of the primary UAV subsystems that will be considered in this course are as follows.

Airframe and Propulsion: The role of the basic airframe/propulsion subsystem of the UAV in setting operational mission bounds for different classes of UAVs, from micro UAVs, through to larger vehicles.

Flight Control and Avionics: Typical UAV primary flight control systems; Sensor requirements to support different levels of operation (eg auto-land vs remote-control landing etc.,); Redundancy requirements.

Navigation: Navigation requirements; inertial navigation; aiding via use of GPS; strategies to combat GPS failures.

Typical Payloads: Electro-Optical (EO); Infra-Red (IR); Electronic Warfare (EW); Electronic Surveillance (ES); Radar and others. Payload stabilization and pointing accuracy requirements.

Air-Ground Communication Link: Typical Civilian and Military communication links. Range, Security, Bandwidth, Cost issues. Ground Station: Air-vehicle monitoring; payload monitoring; data dissemination; control of multiple vehicles.

The course will also consider other general issues associated with modern UAV systems including multi-vehicle systems, certification of UAV systems and others. As part of the course students will spend 1 day operating a UAV system, with their own mission guidance/mission control software on board.

AERO9760
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. **Prohibitions:** AERO5760 **Assessment:** Through semester assessment (100%) **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.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 2 hrs/week; Lecture 1 hr/week; Tutorial 1 hr/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. **Assessment:** Through semester assessment (100%) **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/diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5310
Engineering Tribology

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs; Tutorial 3 hrs/week; Seminar 3 hrs/week. **Assumed knowledge:** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim is to teach students in the undergraduate and postgraduate levels basic concepts about friction, lubrication and wear applicable to design and operation of mechanical systems used in engineering, industrial, and modern applications. Examples of these systems are lubrication of internal combustion engines, gearboxes, artificial hip/knee joints, and micro/nano electromechanical systems.

AMME5510
Vibration and Acoustics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** (AMME2301 OR AMME9301) AND AMME2200 AND (AMME2500 OR AMME9500) **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This UoS should prepare the student to be able to undertake vibration and acoustic measurement calculations for industry design situations.

The unit aims to introduce a number of new concepts required for analysis of vibrations and acoustics. The response of structure under different dynamic forces, including human and aerodynamic, will be investigated. A number of hands-on experiments will be performed to allow an understanding of the concepts and applicability.

The acoustics component will include: basic acoustics theory, sound generation and propagation, impedance, absorbing materials, industrial noise sources, isolation methods of noise control, enclosures, instrumentation and measurement, frequency analysis, noise regulations and computational acoustics.

AMME5520
Advanced Control and Optimisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Research 1 hr/week. **Prerequisites:** AMME3500 OR AMME5501 OR AMME9501 **Assumed knowledge:** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces engineering design via optimization, i.e. finding the "best possible" solution to a particular problem. For example, an autonomous vehicle must find the fastest route between two locations over a road network; a biomedical sensing device must compute the most accurate estimate of important physiological parameters from noise-corrupted measurements; a feedback control system must stabilize and control a multivariable dynamical system (such as an aircraft) in an optimal fashion.

The student will learn how to formulate a design in terms of a "cost function", when it is possible to find the "best" design via minimization of this "cost", and how to do so. The course will introduce widely-used optimization frameworks including linear and quadratic programming (LP and QP), dynamic programming (DP), path planning with Dijkstra's algorithm, A*, and probabilistic roadmaps (PRMs), state estimation via Kalman filters, and control via the linear quadratic regulator (LQR) and Model Predictive Control (MPC). There will be constant emphasis on connections to real-world engineering problems in control, robotics, aerospace, biomedical engineering, and manufacturing.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

MECH5275
Advanced Renewable Energy

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) **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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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 hr/week; Tutorial 1 hr/week; Laboratory 3 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Students will attend a series lectures on failure analyses of engineering materials addressing brittle rupture/fracture, yielding, cleavage fracture, fatigue and creep failure of engineering materials under static and dynamic loads. Students will also attend short introduction courses on optical microscopy and scanning electron microscopy (SEM) to gain some essential knowledge in diagnostic and forensic analyses of materials failure. Each student participates in a couple of group projects relevant to diagnostic analyses of failure of typical engineering materials such as steel, aluminium, magnesium alloys, engineering plastics and advanced fibre composites. Under the guidance of the supervisor, the student will learn how to initiate a proposal on failure analysis, how to do the project investigation and how to prepare and carry out technical communications (oral presentation and discussion between groups). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.

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:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 3 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The UoS covers the key knowledge of most smart materials such as dielectric, piezoelectric, magneto-electric and shape memory materials. Each student participates in a couple of group projects relevant to characterization of structure-property relationship of functional structures with desired performance. Under the guidance of the supervisor, the student will learn how to develop a proposal, how to do the project investigation and how to prepare and carry out the technical communications (writing and oral). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.

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:** Lecture 2 hrs/week; Tutorial 3 hrs/week; Laboratory 3 hrs. **Prohibitions:** MECH4310 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.

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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units AMME5020 and AMME5022 (total 18 cp) in place of Capstone Project AMME5021 and 6 cp of elective units.

AMME5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Corequisites:** AMME5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B Extended covers the second of stage writing up and presenting the research results. This extended version of Capstone Project allows the student to investigate a topic of greater depth and scope.

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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units AMME5222 and AMME5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

AMME5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

AMME5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements of the degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Biomedical Engineering

Course overview

A postgraduate specialisation in Biomedical Engineering will allow you to apply engineering principles in order to understand, modify or control biological systems.

You will also learn how to develop technology to monitor physiological functions and to assist in diagnosis and treatment of patients.

Areas of study include biomaterials engineering, applied tissue engineering, advanced engineering materials and computational fluid dynamics.

This degree has been given full accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia.

Course requirements

Candidates for the Master of Professional Engineering (Biomedical) complete 144 credit points as listed in the unit of study table.

Candidates also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session

Master of Professional Engineering (Biomedical)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below.

Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME9261 **Fluid Mechanics 1**	6	**A** Students are expected to be familiar with first year basic maths: integral calculus, differential calculus and linear algebra. **N** AMME5200	Semester 1
AMME9500 **Engineering Dynamics**	6	**A** Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **N** AMME5500	Semester 1
AMME9700 **Instrumentation**	6	**A** Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. **N** AMME5700	Semester 1
ENGG9801 **Engineering Computing**	6	**N** ENGG5801	Semester 1

Year One - Semester Two

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME9262 **Thermal Engineering 1**	6	**A** Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra. **N** AMME9200 OR AMME5200.	Semester 2
AMME9301 **Mechanics of Solids 1**	6	**A** Physics, statics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **N** AMME5301	Semester 2
AMME9302 **Materials 1**	6	**N** : AMME5302 OR CIVL5501	Semester 1 Semester 2
AMME9901 **Anatomy and Physiology for Engineers**	6	**A** 6cp minimum of Junior level Biology **N** AMME5901	Semester 2

Year Two - Semester One

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME9501 **System Dynamics and Control**	6	**A** AMME5500 OR AMME9500 **N** AMME5501	Semester 1
MECH9261 **Fluid Mechanics 2**	6	**A** AMME9200. Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **N** MECH5261	Semester 1
MECH9362 **Materials 2**	6	**A** Mechanics of solids: statics, stress, strain **P** AMME9302 OR AMME5302 **N** MECH5362	Semester 1
MECH9660 **Manufacturing Engineering**	6	**P** MECH9400 or MECH5400 or MECH2400 **N** MECH5660	Semester 1

Year Two - Semester Two

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME5921 **Biomedical Engineering Tech 2**	6	**A** This is an introductory Masters of Engineering unit. A bachelors degree, ideally in the engineering or science field, is advisory, but not essential.	Semester 2
ENGG5214 **Management of Technology**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
MECH9361 **Mechanics of Solids 2**	6	**A** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **P** AMME9301 OR AMME5301 **N** MECH5361	Semester 2

Please note that ENGG5214 is not available as a core unit for 2015, but may be taken as a Biomedical Elective. Candidates take 12 credit points of Biomedical elective units in Year 2 Semester 2.

Year Three - Semester One

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study).	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME9971 **Tissue Engineering**	6	**A** 6 credit points of junior biology, 6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent. **N** AMME5971 *The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of junior and intermediate biology and thus students will already have practical hands-on biological training. The purpose of this UoS is to elaborate the theory and latest developments of this very new field of tissue engineering, thereby building on the existing practical and theoretical knowledge base the students have in cell biology.*	Semester 1
AMME9981 **Computational Biomedical Engineering**	6	**A** AMME9301, AMME9302, AMME9500, and MECH9361. **N** AMME5981 *The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.*	Semester 1
AMME9990 **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. **N** AMME5990 *The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.*	Semester 1
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5020 and 6cp of recommended electives with AMME5222 Dissertation A.

Year Three - Semester Two

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME5021 **Capstone Project B**	6	**C** AMME5020	Semester 1 Semester 2
AMME9961 **Biomechanics and Biomaterials**	6	**A** Chemistry, Biology, Materials Engineering, and Engineering Design at least at the Junior level. **N** AMME5961	Semester 2
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5021 and 6cp of recommended electives with AMME5223 Dissertation B.

Select 6 credit points from Biomedical recommended electives block.

Elective units

Candidates must complete 12 credit points from the following Biomedical elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field. *Note: Department permission required for enrolment* *Department Permission required for Enrolment*	Semester 2
AERO9301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field. **P** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **N** AERO5301	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** The students will require 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. *Note: Department permission required for enrolment*	Semester 2
AMME5310 **Engineering Tribology**	6	**A** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261)	Semester 1
AMME5520 **Advanced Control and Optimisation**	6	**A** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **P** AMME3500 OR AMME5501 OR AMME9501	Semester 1
AMME5912 **Crash Analysis and Design**	6	**A** Computer Aided Drafting, Basic FEA principles and Solid Mechanics	Semester 1
AMME5951 **Fundamentals of Neuromodulation**	6	**A** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent.	Semester 1
CHNG5602 **Cellular Biophysics**	6	*Note: Department permission required for enrolment*	Semester 1
ELEC5803 **Advanced Bioelectronics**	6	**A** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **P** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) *Note: Department permission required for enrolment*	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1

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. **P** MECH3260 **N** MECH4255	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. **P** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) *Note: Department permission required for enrolment*	Semester 2
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 *Note: Department permission required for enrolment* *Students will attend a series lectures on failure analyses of engineering materials addressing brittle rupture/fracture, yielding, cleavage fracture, fatigue and creep failure of engineering materials under static and dynamic loads. Students will also attend short introduction courses on optical microscopy and scanning electron microscopy (SEM) to gain some essential knowledge in diagnostic and forensic analyses of materials failure. Each student participates in a couple of group projects relevant to diagnostic analyses of failure of typical engineering materials such as steel, aluminium, magnesium alloys, engineering plastics and advanced fibre composites. Under the guidance of the supervisor, the student will learn how to initiate a proposal on failure analysis, how to do the project investigation and how to prepare and carry out technical communications (oral presentation and discussion between groups). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.*	Semester 2
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310 *Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.*	Semester 1
MECH5416 **Advanced Design and Analysis**	6	**A** 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	Semester 1
MECH5720 **Sensors and Signals**	6	**A** Strong MATLAB skills **N** MECH4720	Semester 2
MTRX5700 **Experimental Robotics**	6	**A** Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed. **P** (AMME3500 OR AMME9501) AND MTRX3700	Semester 1

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.

Extended Capstone Project candidates take Capstone Project units AMME5020 and AMME5022 (total 18 cp) in place of Capstone Project AMME5021 and 6 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study).	Semester 1 Semester 2
AMME5021 **Capstone Project B**	6	**C** AMME5020	Semester 1 Semester 2
AMME5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.

Research pathway candidates take Dissertation units AMME5222 and AMME5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME5222 **Dissertation A**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2
AMME5223 **Dissertation B**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Biomedical)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

AMME9261
Fluid Mechanics 1

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 3 hours per week; Tutorial: 2 hours per week; Laboratory: 6 hours overall. **Prohibitions:** AMME5200 **Assumed knowledge:** Students are expected to be familiar with first year basic maths: integral calculus, differential calculus and linear algebra. **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the fundamentals of fluid statics and fluid dynamics. At the end of this unit students will have: an understanding of the basic equations governing the statics and dynamics of fluids; the ability to analyze and determine the forces applied by a 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 basic concepts of viscosity, density, continuum, pressure, force, buoyancy, acceleration, continuity, conservation of momentum, streamlines, Bernoulli equation, Euler equation, Navier-Stokes equation. Experiments will introduce flow measuring devices and flow observation.

AMME9500
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. **Prohibitions:** AMME5500 **Assumed knowledge:** Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

AMME9700
Instrumentation

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hrs of lectures per week, 1hr of tutorials per week, 6 hrs of laboratory work per semester. **Prohibitions:** AMME5700 **Assumed knowledge:** Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to develop in students an understanding of the engineering measurements and instrumentation systems. The students will acquire an ability to make accurate and meaningful measurements. It will cover the general areas of electrical circuits and mechanical/electronic instrumentation for strain, force, pressure, moment, torque, displacement, velocity, acceleration, temperature and so on.

ENGG9801
Engineering Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week **Prohibitions:** ENGG5801 **Assessment:** Through semester assessment (50%), Final Exam (50%) **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. There will be a major project which uses programming to solve a real world engineering problem. 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.

Year One - Semester Two

AMME9262
Thermal Engineering 1

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 2 hours per week; Laboratory: 12 hours overall. **Prohibitions:** AMME9200 OR AMME5200. **Assumed knowledge:** Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra. **Assessment:** Through semester assessment (50%), Final Exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to teach the basic laws of thermodynamics and heat transfer. At the end of this unit students will have: an understanding of the basic laws of thermodynamics and heat transfer; The ability to analyze the thermodynamics of a simple open or closed engineering system. The basic knowledge to analyse and design 1D thermal circuits. 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, heat transfer by conduction,

convection and radiation, 1D thermal circuits and transient heat transfer.

AMME9301
Mechanics of Solids 1

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 3 hours per week; Tutorials: 2 hours per week **Prohibitions:** AMME5301 **Assumed knowledge:** Physics, statics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **Assessment:** Through semester assessment (35%), Final Exam (65%) **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.

AMME9302
Materials 1

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lectures : 3 hours per week; Tutorials : 2 hours per week; Laboratory: one 3 hour session. **Prohibitions:** : AMME5302 OR CIVL5501 **Assessment:** Through semester assessment (46%), Final Exam (54%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit 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.

AMME9901
Anatomy and Physiology for Engineers

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 2.5 hours per week; Laboratory: 2 hours per week. **Prohibitions:** AMME5901 **Assumed knowledge:** 6cp minimum of Junior level Biology **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

Year Two - Semester One

AMME9501
System Dynamics and Control

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures : 2 hours per week; Tutorials : 3 hours per week **Prohibitions:** AMME5501 **Assumed knowledge:** AMME5500 OR AMME9500 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

MECH9261
Fluid Mechanics 2

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; Project Work - in class: 3 hours per week **Prohibitions:** MECH5261 **Assumed knowledge:** AMME9200. Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **Assessment:** Through semester assessment(60%), Final Exam (40%) **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 dimensionless analysis, Bernoulli equation, pipe flow, frictional losses, laminar and turbulent boundary layers, open channel flow and hydraulic jump, lift and drag, compressible flow and shock waves, turbomachinery .

MECH9362
Materials 2

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** AMME9302 OR AMME5302 **Prohibitions:** MECH5362 **Assumed knowledge:** Mechanics of solids: statics, stress, strain **Assessment:** Through semester assessment (45%), Final Exam (55%) **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.

MECH9660
Manufacturing Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** MECH9400 or MECH5400 or MECH2400 **Prohibitions:** MECH5660 **Assessment:** Through semester assessment (100%) **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); merits and limitations; CNC and CAM;

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

Year Two - Semester Two

AMME5921
Biomedical Engineering Tech 2

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 4 hrs/week. **Assumed knowledge:** This is an introductory Masters of Engineering unit. A bachelors degree, ideally in the engineering or science field, is advisory, but not essential. **Assessment:** Through semester assessment (100%) **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.

ENGG5214
Management of Technology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Uos is designed to develop competence in the management of technology. It will address all aspects of the management of technology, the nature and importance of technological change and innovation, within the context of the global knowledge economy, the management of the new product development process, the role of technology in manufacturing and service competitiveness, the role of IT in logistics management, supply chain strategies, and communication, and the characteristics of high technology markets.

MECH9361
Mechanics of Solids 2

Credit points: 6 **Session:** Semester 2 **Classes:** Tutorial: 2 hours per week; Lecture: 3 hours per week; Laboratory: 1 hours per week **Prerequisites:** AMME9301 OR AMME5301 **Prohibitions:** MECH5361 **Assumed knowledge:** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **Assessment:** Through semester assessment(70%), Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The UoS aims to: teach the fundamentals of analysing stress and deformation in a solid under complex loading associated with the elemental structures/components in aerospace, mechanical and biomedical engineering; develop the following attributes: understand the fundamental principles of solid mechanics and basic methods for stress and deformation analysis of a solid structure/element in the above mentioned engineering areas; gain the ability to analyse problems in terms of strength and deformation in relation to the design, manufacturing and maintenance of machines, structures, devices and elements in the above mentioned engineering areas.

At the end of this unit students will have a good understanding of the following: applicability of the theories and why so; how and why to do stress analysis; why we need equations of motion/equilibrium; how and why to do strain analysis; why we need compatibility equations; why Hooke`s law, why plasticity and how to do elastic and plastic analysis; how and why to do mechanics modelling; how to describe boundary conditions for complex engineering problems; why and how to solve a mechanics model based on a practical problem; why and how to use energy methods for stress and deformation analysis; why and how to do stress concentration analysis and its relation to fracture and service life of a component/structure; how and why to do fundamental plastic deformation analysis; how and why the finite element method is introduced and used for stress and deformation analysis.

The students are expected to develop the ability of solving engineering problems by comprehensively using the skills attained above. The students will get familiar with finite element analysis as a research and analysis tool for various real-life problems.

Please note that ENGG5214 is not available as a core unit for 2015, but may be taken as a Biomedical Elective. Candidates take 12 credit points of Biomedical elective units in Year 2 Semester 2.

Year Three - Semester One

AMME5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME9971
Tissue Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures: 2 hours per week; Tutorials: 2 hours per week **Prohibitions:** AMME5971 **Assumed knowledge:** 6 credit points of junior biology, 6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of junior and intermediate biology and thus students will already have practical hands-on biological training. The purpose of this UoS is to elaborate the theory and latest developments of this very new field of tissue engineering, thereby building on the existing practical and theoretical knowledge base the students have in cell biology.

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:

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.

AMME9981
Computational Biomedical Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorial: 2 hours per week; Lecture: 3 hours per week; Research: 4 hours per week; Meeting: 1 hours per week; **Prohibitions:** AMME5981 **Assumed knowledge:** AMME9301, AMME9302, AMME9500, and MECH9361. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.

This unit of study 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;

AMME9990
Biomedical Engineering Tech 1

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; **Prohibitions:** AMME5990 **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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of engineering principles and junior and intermediate biology. The purpose of this UoS is prepare students for the challenges presented in taking innovative ideas and successfully converting them to valuable products.

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.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5020 and 6cp of recommended electives with AMME5222 Dissertation A.

Year Three - Semester Two

AMME5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Corequisites:** AMME5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME9961
Biomechanics and Biomaterials

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 3 hours per week **Prohibitions:** AMME5961 **Assumed knowledge:** Chemistry, Biology, Materials Engineering, and Engineering Design at least at the Junior level. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course is divided into two parts: biomechanics and biomaterials:

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.

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 metals, then polymers (thermoplastic, thermosetting, and biodegradable), and finally ceramics (bioinert, biodegradable, and bioactive).

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5021 and 6cp of recommended electives with AMME5223 Dissertation B.

Select 6 credit points from Biomedical recommended electives block.

Elective units

Candidates must complete 12 credit points from the following Biomedical elective units.

AERO5010
Optimisation Methods in Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time 10 hrs/week. **Assumed knowledge:** BE in the area of Aerospace or related Engineering field. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Department Permission required for Enrolment

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.

Note: Department Permission required for enrolment

AERO9301
Applied Finite Element Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** 2.5 hours of lectures and 2 hours of workgroup session per week **Prerequisites:** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **Prohibitions:** AERO5301 **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (55%), Final Exam (45%) **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.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 2 hrs/week; Lecture 1 hr/week; Tutorial 1 hr/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. **Assessment:** Through semester assessment (100%) **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/diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 3 hrs/week. **Assumed knowledge:** The students will require 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

AMME5310
Engineering Tribology

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs; Tutorial 3 hrs/week; Seminar 3 hrs/week. **Assumed knowledge:** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim is to teach students in the undergraduate and postgraduate levels basic concepts about friction, lubrication and wear applicable to design and operation of mechanical systems used in engineering, industrial, and modern applications. Examples of these systems are lubrication of internal combustion engines, gearboxes, artificial hip/knee joints, and micro/nano electromechanical systems.

AMME5520
Advanced Control and Optimisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Research 1 hr/week. **Prerequisites:** AMME3500 OR AMME5501 OR AMME9501 **Assumed knowledge:** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces engineering design via optimization, i.e. finding the "best possible" solution to a particular problem. For example, an autonomous vehicle must find the fastest route between two locations over a road network; a biomedical sensing device must compute the most accurate estimate of important physiological parameters from noise-corrupted measurements; a feedback control system must stabilize and control a multivariable dynamical system (such as an aircraft) in an optimal fashion.

The student will learn how to formulate a design in terms of a "cost function", when it is possible to find the "best" design via minimization of this "cost", and how to do so. The course will introduce widely-used optimization frameworks including linear and quadratic programming (LP and QP), dynamic programming (DP), path planning with Dijkstra's algorithm, A*, and probabilistic roadmaps (PRMs), state estimation via Kalman filters, and control via the linear quadratic regulator (LQR) and Model Predictive Control (MPC). There will be constant emphasis on connections to real-world engineering problems in control, robotics, aerospace, biomedical engineering, and manufacturing.

AMME5912
Crash Analysis and Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - own time, **Assumed knowledge:** Computer Aided Drafting, Basic FEA principles and Solid Mechanics **Assessment:** Through semester assessment (100%) **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-PreSys, 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.

AMME5951
Fundamentals of Neuromodulation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Implantable microelectronic devices functioning either as nerve stimulators or nerve blockers comprise one of the largest markets in the global medical device industry. The aim of this unit of study is to give students a complete overview of the underlying technology (microelectronics, encapsulation biomaterials, electrode biomaterials, electrode-neural interactions, inductive power systems and data links, signal processing) and an expert review of the major technological applications on the market, which include Cochlear implants, pacemakers and implantable defibrillators, deep brain stimulators, pain control nerve blockers, bionic eye implants, functional electrical stimulation systems. The unit will also review emerging applications such as gastrointestinal disorders, obesity; vagal nerve stimulation - epilepsy, depression, carotid artery stimulation - hypertension, spinal cord stimulation - ischemic disorders, angina, peripheral vascular disease, incontinence, erectile dysfunction. The unit will conclude with a snapshot of the future: "brain on a chip" progress, nerve regrowth, neurotropins, drug/device combinations. This is a Master of Professional Engineering Unit of Study intended for biomedical engineering students with an interest in working in the medical device industry in the large market sector area of implantable electronic devices.

CHNG5602
Cellular Biophysics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 4 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5803
Advanced Bioelectronics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) **Assumed knowledge:** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will cover advanced topics in the application of electronics and signal processing to physiological monitoring, biosensors, electrical stimulation and medical imaging. Electrical safety and regulations of medical devices in Australia will be introduced. Guest lectures will describe the different needs and requirements in several clinical areas including neonatal care, oncology, cardiology and neurology.

Assumed Knowledge: A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

MECH5255
Air Conditioning and Refrigeration (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prerequisites:** MECH3260 **Prohibitions:** MECH4255 **Assumed knowledge:** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

MECH5275
Advanced Renewable Energy

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) **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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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 hr/week; Tutorial 1 hr/week; Laboratory 3 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Students will attend a series lectures on failure analyses of engineering materials addressing brittle rupture/fracture, yielding, cleavage fracture, fatigue and creep failure of engineering materials under static and dynamic loads. Students will also attend short introduction courses on optical microscopy and scanning electron microscopy (SEM) to gain some essential knowledge in diagnostic and forensic analyses of materials failure. Each student participates in a couple of group projects relevant to diagnostic analyses of failure of typical engineering materials such as steel, aluminium, magnesium alloys, engineering plastics and advanced fibre composites. Under the guidance of the supervisor, the student will learn how to initiate a proposal on failure analysis, how to do the project investigation and how to prepare and carry out technical communications (oral presentation and discussion between groups). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.

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.

MECH5310
Advanced Engineering Materials

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 3 hrs/week; Laboratory 3 hrs. **Prohibitions:** MECH4310 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.

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.

MECH5416
Advanced Design and Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

1. 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.

2. 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.

3. 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.

MECH5720
Sensors and Signals

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 3 hrs/week; Project Work - own time 2 hrs/week; Presentation 2 hrs; Laboratory 2 hrs; Tutorial 2 hrs/week. **Prohibitions:** MECH4720 **Assumed knowledge:** Strong MATLAB skills **Assessment:** Through semester assessment (75%) Final Exam (25%) **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: Convolution, The Fourier Transform, Modulation (FM, AM, FSK, PSK etc), Frequency shifting (mixing)

b) PASSIVE SENSORS: Infrared Radiometers, Imaging Infrared, Passive Microwave Imaging, Visible Imaging & Image Intensifiers

c) ACTIVE SENSORS THE BASICS: Operational Principles, Time of flight (TOF) Measurement & Imaging of Radar, Lidar and Sonar, Radio Tags and Transponders, Range Tacking, 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.

MTRX5700
Experimental Robotics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 3 hrs/week; Lecture 2 hrs/week. **Prerequisites:** (AMME3500 OR AMME9501) AND MTRX3700 **Assumed knowledge:** Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed. **Assessment:** Through semester assessment (70%) Final Exam (30%) **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 manufacturing, automobile systems and assembly systems; develop the capacity to think critically 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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units AMME5020 and AMME5022 (total 18 cp) in place of Capstone Project AMME5021 and 6 cp of elective units.

AMME5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Corequisites:** AMME5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B Extended covers the second of stage writing up and presenting the research results. This extended version of Capstone Project allows the student to investigate a topic of greater depth and scope.

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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units AMME5222 and AMME5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

AMME5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

AMME5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Chemical and Biomolecular Engineering

Course overview

A postgraduate specialisation in Chemical and Biomolecular Engineering is concerned with industrial processes in which material in bulk undergoes changes in its physical or chemical nature.

Chemical and biomolecular engineers design, construct, operate and manage these processes and in this they are guided by economic, environmental and societal considerations.

Areas of study include process system engineering, biophysical systems and membrane science.

This degree has been given full accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia

Course requirements

Candidates for the Master of Professional Engineering (Chemical and Biomolecular Engineering) complete 144 credit points as listed in the unit of study table.

Candidates also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Chemical and Biomolecular)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
CHNG9201 **Conservation and Transport Processes**	6	**A** Calculus, Computations (Matlab, Excel), Mass and Energy Balances. **N** CHNG5701 OR CHNG2801	Semester 1
CHNG9202 **Applied Maths for Chemical Engineers**	6	**A** Enrolment in this unit of study assumes that first year undergraduate core maths, science and engineering UoS (or their equivalent) have been successfully completed. **N** CHNG2802 OR CHNG5702 *School permission required.*	Semester 1
CHNG9203 **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 OR CHNG5703	Semester 1
ENGG5011 **Foundation Engineering Studies A**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Main
Year One - Semester Two			
CHNG9103 **Material & Energy Transformations Intro**	6	**N** CHNG1103	Semester 2
CHNG9204 **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. **N** CHNG2804 OR CHNG5704	Semester 2
CHNG9206 **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 **N** CHNG2806 OR CHNG5706	Semester 2
CHNG9304 **Biochemical Engineering**	6	**N** : CHNG3804 OR CHNG5804	Semester 2
Year Two - Semester One			
CHNG9301 **Process Design**	6	**P** (CHNG9201 OR CHNG5701) AND (CHNG9202 OR CHNG5702) AND (CHNG9203 OR CHNG5703) AND (CHNG9204 OR CHNG5704) AND (CHNG9206 OR CHNG5706) **C** CHNG9302 **N** CHNG5801	Semester 1
CHNG9302 **Control and Reaction Engineering**	6	**P** (CHNG9201 OR CHNG5701) AND (CHNG9202 OR CHNG5702) AND (CHNG9203 OR CHNG5703) AND (CHNG9204 OR CHNG5704) AND (CHNG9206 OR CHNG5706) **C** CHNG9301 **N** CHNG5802	Semester 1
CHNG9303 **Chemical and 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** (CHNG9201 OR CHNG5701) AND (CHNG9202 OR CHNG5702) AND (CHNG9204 OR CHNG5704) **N** CHNG3803 OR CHNG5803	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Year Two - Semester Two			
CHNG9305 **Product Formulation and 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** (CHNG9201 OR CHNG5701) AND (CHNG9202 OR CHNG5702) AND (CHNG9204 OR CHNG5704) **N** CHNG3805 OR CHNG5805	Semester 2
CHNG9306 **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** (CHNG9201 OR CHNG5701) AND (CHNG9202 OR CHNG5702) AND (CHNG9204 OR CHNG5704). [These prerequisites may have been partially or fully met in students prior learning] **N** : CHNG3806 OR CHNG5806	Semester 2
Select 12 credit points from Specialist electives/Management electives. Candidates must complete 24 credit points from Specialisation Electives and 6 credit points from Management Electives across Year Two and Year Three.			
Year Three - Semester One			
CHNG5020 **Capstone Project A**	6	**A** (CHNG9301 OR CHNG5801) AND (CHNG9302 OR CHNG5802) AND (CHNG9303 OR CHNG5803) AND (CHNG9305 OR CHNG5805) AND (CHNG9306 OR CHNG5806). **P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) *School permission required for enrolment in semester 2.*	Semester 1 Semester 2
CHNG9402 **Chemical Engineering Design A**	6	**A** Enrollment in this unit of study assumes that all core chemical engineering UoS, apart from final year, have been successfully completed. **P** (CHNG9301 OR CHNG5801) AND (CHNG9302 OR CHNG5802) AND (CHNG9305 OR CHNG5805) AND (CHNG9306 OR CHNG5806). **N** CHNG5112	Semester 1
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CHNG5020 and 6CP of recommended electives with CHNG5222 Dissertation A.			
Select 12 credit points from Specialist electives/Management electives. Candidates must complete 24 credit points from Specialisation Electives and 6 credit points from Management Electives across Year Two and Year Three.			
Year Three - Semester Two			
CHNG5021 **Capstone Project B**	6	**A** Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. **C** CHNG5020 *School permission required for enrolment in session 1.*	Semester 1 Semester 2
CHNG9406 **Chemical Engineering Design B**	6	**A** Enrollment in this unit of study assumes that all core chemical engineering units of study, apart from final year, have been successfully completed. **P** CHNG9402 OR CHNG5112 **N** CHNG5116	Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CHNG5021 and 6cp of recommended electives with CHNG5223 Dissertation B.			
Select 12 credit points from Specialist electives/Management electives. Candidates must complete 24 credit points from Specialisation Electives and 6 credit points from Management Electives across Year Two and Year Three.			
Specialist elective units Candidates must complete 24 credit points from the following Chemical & Biomolecular Specialist elective units.			
CHNG5001 **Process Systems Engineering**	6	**A** First year undergraduate physics and mathematics (differential equations). Use of mathematical and/or computer-based modelling tools and techniques. Feedback control concepts and principles as taught in CHNG3802/CHNG5802 or similar courses. Students who are unsure about meeting these requirements should contact the unit coordinator for advice. *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** CHNG3801 AND CHNG3802 AND CHNG3803 AND CHNG3805 AND CHNG3806 AND CHNG3807. All core third year chemical engineering.	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. *Note: Department permission required for enrolment*	Semester 1
CHNG5005 **Wastewater Engineering**	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 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHNG5006 **Advanced Wastewater Engineering**	6	**A** CHNG5005 OR CHNG3804.	Semester 2
CHNG5008 **Nanotechnology in Chemical Engineering**	6	**P** CHNG3801 AND CHNG3802 AND CHNG3805 AND CHNG3806 *Note: Department permission required for enrolment* *Note: School permission required for enrollment.*	Semester 2
CHNG5601 **Membrane Science**	6		Semester 1
CHNG5602 **Cellular Biophysics**	6	*Note: Department permission required for enrolment*	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 *This course is for Master degree students and also is offered as an elective course for fourth year students. Some lectures my be given by a guest lecturer. this*	Semester 1
CHNG5604 **Membrane Engineering Laboratory**	6	**A** CHNG5601	Semester 2
CHNG5605 **Bio-Products: Laboratory to Marketplace**	6	*This course is for Master degree students and also is offered as an elective course for fourth year students. .*	Semester 2

Management elective units

Candidates must complete 6 credit points from the following Management elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5203 **Quality Engineering and Management**	6	**A** First degree in Engineering or a related discipline	Semester 2
ENGG5205 **Professional Practice in PM**	6	*This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.*	Semester 1 Semester 2
ENGG5214 **Management of Technology**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
ENGG5215 **International Eng Strategy & Operations**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
ENGG5216 **Management of Engineering Innovation**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 1

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.

Extended Capstone Project candidates take Capstone Project units CHNG5020 and CHNG5022 (total 18 cp) in place of Capstone Project CHNG5021 and 6 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHNG5020 **Capstone Project A**	6	**A** (CHNG9301 OR CHNG5801) AND (CHNG9302 OR CHNG5802) AND (CHNG9303 OR CHNG5803) AND (CHNG9305 OR CHNG5805) AND (CHNG9306 OR CHNG5806). **P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) *School permission required for enrolment in semester 2.*	Semester 1 Semester 2
CHNG5021 **Capstone Project B**	6	**A** Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. **C** CHNG5020 *School permission required for enrolment in session 1.*	Semester 1 Semester 2
CHNG5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **C** CHNG5020 *Note: Department permission required for enrolment* *Permission required for semester 1 or 2 based on achievement in Capstone Project A and taking other program requirements into consideration.*	Semester 1 Semester 2

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.

Research pathway candidates take Dissertation units CHNG5222 and CHNG5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHNG5222 **Dissertation A**	12	**N** ENGG5221, ENGG5220 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
CHNG5223 **Dissertation B**	12	**N** ENGG5221, ENGG5220 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

MIPPS pathway (Major Industrial Project Placement Scheme)

MIPP pathway candidates take CHNG5205 Major Industrial Project Placement (24 credit points) in place of the Engineering Project units (12 credit points) plus CHNG5112 Foundation of Chemical Engineering Design A and one of the electives from the Specialist Units of Study.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHNG5205 **Major Industrial Placement Project**	24	**P** Passed at least 48 credit points in Master of professional engineering with adequate foundation knowledge in discipline. Students wishing to do this unit of study should contact the Head of School prior to enrolment. **N** : CHNG5112 OR CHNG5020 OR CHNG5021. *Note: Department permission required for enrolment* *Enrolment by permission only. The students enrolled in this subject should have completed 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. Students enrolled in this subject are exempted from completing Chemical Engineering Design A (CHNG9402), Capstone Project A and B (CHNG5020 and CHNG5021) and one of the electives from the Specialist Units of Study that students are expected to take in the first semester of the second year. This exemption is granted because students are exposed to the core aspects of these courses through practical exercises undertaken during the MIPPS placement. While undertaking MIPPS, students have a unique opportunity to see and experience the industrial environment around them, in a manner which is not available at University.MIPPS students are required to enroll in Chemical Engineering Design B (CHNG9406) in the following semester.*	Semester 1
Exchange units Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.			
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Chemical and Biomolecular)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

CHNG9201
Conservation and Transport Processes

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; Laboratory: 6 hours per semester. **Prohibitions:** CHNG5701 OR CHNG2801 **Assumed knowledge:** Calculus, Computations (Matlab, Excel), Mass and Energy Balances. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is designed for postgraduate students who should be proficient at applying the basic principles of mass, energy and momentum balances to solve advanced engineering problems involving 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 advanced 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 CHNG9202. 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, CHNG9203. This integrated course structure is designed to help students become familiar with the multi-disciplinary nature of chemical engineering today.

CHNG9202
Applied Maths for Chemical Engineers

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** CHNG2802 OR CHNG5702 **Assumed knowledge:** Enrolment in this unit of study assumes that first year undergraduate core maths, science and engineering UoS (or their equivalent) have been successfully completed. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: School permission required.

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.

CHNG9203
Energy and Fluid Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - in class: 8 hours per week; **Prohibitions:** CHNG2803 OR CHNG5703 **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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

CHNG2803/9203 is a practically and theoretically-based course, where students will be introduced to types of problems that the modern chemical engineer may be asked to solve. The material is contemporary in nature, and the projects link with the key concepts taught in CHNG2801/9201 and CHNG2802/9202 and across the curriculum.

The objectives in this unit are to provide an interesting, enjoyable, and challenging introduction to fundamental aspects of chemical engineering, particularly conservation and transport processes involving fluids and energy, as well as to the application of mathematical techniques in typical engineering problems.

In this course there is one overall project. The overall goal of the project work throughout this semester is to build a small cooling tower. This cooling tower may be used to cool water from processes that make the water hot, to humidify air that is cold and dry (as in a Sydney winter) or to dehumidify warm wet air (as in a Sydney summer).

The overall project will be split into two sub-projects

i.Fluid mechanics: 4 weeks

ii.Heat and mass transfer: 8 weeks

The project in CHNG9203 addresses transport processes, including the movement of momentum (fluid mechanics), thermal energy (heat transfer) and components with mass. The projects are underpinned by a critical and constructive analysis and best practice in learning and teaching. In addition to the basic knowledge and skills required to pass this unit, the development of an understanding sufficient to enable you to tackle new and unfamiliar problems will be emphasized. You will learn to work in largely unsupervised groups and to be responsible for managing your individual and group performance.

ENGG5011
Foundation Engineering Studies A

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Main **Classes:** Project Work - own time 8 hrs. **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

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.

Year One - Semester Two

CHNG9103
Material & Energy Transformations Intro

Credit points: 6 **Session:** Semester 2 **Classes:** 3hr lectures per week, 2hr tutorials per week **Prohibitions:** CHNG1103 **Assessment:** Through semester assessment (50%), Final Exam (50%) **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. Students will also develop a preliminary understanding in the use of process simulator (e.g., Hysis) to formulate and solve material and energy problems around simple models of unit operations and recycles.

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.

CHNG9204
Chemical & Biological Systems Behaviour

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; Project Work - own time: 4 hours per week. **Prohibitions:** CHNG2804 OR CHNG5704 **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. **Assessment:** Through semester assessment (70%), Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

CHNG9206
Materials Purification and Recovery

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorials/Practical Sessions: 3 hours per week. **Prohibitions:** CHNG2806 OR CHNG5706 **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 **Assessment:** Through semester assessment (60%), Final Exam (40%) **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 project-driven case studies covering a range of integrated analysis scenarios, from the domain of energy, thermodynamic and fluid systems. In this course, the focus is on the production of alcohol (by fermentation) and the separation of this alcohol (by distillation).

The fermentation related topics include: biotechnology; the process of fermentation; organism; requirements for growth and the metabolic pathways that lead to the generation of specific products; the application of the principles of mass balance and thermodynamics in the analysis of bioprocessing systems; growth and product stoichiometry; elemental and electron balance; equations; the use of electron balance equations and energy balance equations in estimating the growth heat of reaction; bioprocessing heat of reaction and in assessing the cooling requirements of fermentation systems and concepts of analytical chemistry with relevance to the analysis of the process of fermentation. Distillation related topics include: Distillation vapour liquid equilibrium (VLE); operation of a distillation column; use of Hysis to formulate and solve material and energy problems around distillation unit operations

This course is a concurrent requirement for the concept and enabling technology courses running in parallel in the same semester.

CHNG9304
Biochemical Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures, 1 hour of tutorials per week. 8 hours of laboratory work per semester. **Prohibitions:** : CHNG3804 OR CHNG5804 **Assessment:** Through semester assessment (60%), Final Exam (40%) **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.

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.

Year Two - Semester One

CHNG9301
Process Design

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** (CHNG9201 OR CHNG5701) AND (CHNG9202 OR CHNG5702) AND (CHNG9203 OR CHNG5703) AND (CHNG9204 OR CHNG5704) AND (CHNG9206 OR CHNG5706) **Corequisites:** CHNG9302 **Prohibitions:** CHNG5801 **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study consists of two strands: (1) vapour-liquid equilibrium and distillation and (2) heat transfer and heat exchangers. The central aim is to show how these unit operations interact in the design and operation of process equipment. The first strand focuses on the following; numerical methods for predicting vapour-liquid equilibrium; binary and multi-component distillation; deviations from ideal behaviour. The second strand of this unit of study focuses on the understanding of the differences between various conventional heat exchanger types and their strengths and weaknesses. Students will understand and be able to design a range of conventional heat exchangers using a systematic approach, and will focus on design and heat transfer calculations. The two 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 CHNG9302. 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, CHNG9303. This integrated course structure is designed to help students become familiar with the multi-disciplinary nature of chemical engineering today.

CHNG9302
Control and Reaction Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** (CHNG9201 OR CHNG5701) AND (CHNG9202 OR CHNG5702) AND (CHNG9203 OR CHNG5703) AND (CHNG9204 OR CHNG5704) AND (CHNG9206 OR CHNG5706) **Corequisites:** CHNG9301 **Prohibitions:** CHNG5802 **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Aims and Objectives: This Unit of study has two strands: the first is reaction engineering while the second is concerned with process modelling and process control. The first strand of this unit of study focuses on the understanding of the key concepts of reaction engineering in process design. It covers reaction kinettics, stoichiometry, reactor design, multiple reaction systems, catalysis and using reaction data to estimate rate laws. All industrial processes require some process monitoring and control for satisfactory operation. The first strand commences with process data management before moving on to empirical modelling. The second strand 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, and the use of control related software. This UoS demonstrates that: process control is an integral concept 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 (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; appreciate the limitations that exist whenever mathematical models are used as the basis for process control; 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.

CHNG9303
Chemical and Biological Processes

Credit points: 6 **Session:** Semester 1 **Classes:** 4 hours of in-class project work per week. **Prerequisites:** (CHNG9201 OR CHNG5701) AND (CHNG9202 OR CHNG5702) AND (CHNG9204 OR CHNG5704) **Prohibitions:** CHNG3803 OR CHNG5803 **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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a project based unit of study where students will work in small teams through three project-driven case studies covering a range of design scenarios, from the domain of chemical and biological processes. This course runs in parallel with CHNG5801 and CHNG5802, and the projects allow the students to demonstrate their kowledge of process modelling, the design of rate and equilibrium processes, the control of chemical processes and the practical and commercial aspects of design. Projects include designing equipment such as fermenters, reactors, distillation columns and heat exchangers, determining the optimal operating conditions for individual items of equipment, estimating the operating costs of processes, designing small flowsheets and designing simple control systems. By the end of this unit students will be proficient in estimating the feasibility of processes, desigining individual items of equipment and designing small flowsheets.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

Year Two - Semester Two

CHNG9305
Product Formulation and Design

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 1 hours of tutorials per week. **Prerequisites:** (CHNG9201 OR CHNG5701) AND (CHNG9202 OR CHNG5702) AND (CHNG9204 OR CHNG5704) **Prohibitions:** CHNG3805 OR CHNG5805 **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. **Assessment:** Through semester assessment (55%), Final Exam (45%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

CHNG9306
Management of Industrial Systems

Credit points: 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 3 hours of tutorials per week. **Prerequisites:** (CHNG9201 OR CHNG5701) AND (CHNG9202 OR CHNG5702) AND (CHNG9204 OR CHNG5704). [These prerequisites may have been partially or fully met in students prior learning] **Prohibitions:** : CHNG3806 OR CHNG5806 **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. **Assessment:** Through semester assessment (100%) **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.

Select 12 credit points from Specialist electives/Management electives.

Candidates must complete 24 credit points from Specialisation Electives and 6 credit points from Management Electives across Year Two and Year Three.

Year Three - Semester One

CHNG5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting 1 hr/week; Project Work - own time 5 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assumed knowledge:** (CHNG9301 OR CHNG5801) AND (CHNG9302 OR CHNG5802) AND (CHNG9303 OR CHNG5803) AND (CHNG9305 OR CHNG5805) AND (CHNG9306 OR CHNG5806). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: School permission required for enrolment in semester 2.

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 (Minimum 12 A and B) run over two semesters. 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.Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.

CHNG9402
Chemical Engineering Design A

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** (CHNG9301 OR CHNG5801) AND (CHNG9302 OR CHNG5802) AND (CHNG9305 OR CHNG5805) AND (CHNG9306 OR CHNG5806). **Prohibitions:** CHNG5112 **Assumed knowledge:** Enrollment in this unit of study assumes that all core chemical engineering UoS, apart from final year, have been successfully completed. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the

Research Pathway and may replace CHNG5020 and 6CP of recommended electives with CHNG5222 Dissertation A.

Select 12 credit points from Specialist electives/Management electives.

Candidates must complete 24 credit points from Specialisation Electives and 6 credit points from Management Electives across Year Two and Year Three.

Year Three - Semester Two

CHNG5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting 1 hr/week; Project Work - own time 5 hrs/week. **Corequisites:** CHNG5020 **Assumed knowledge:** Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: School permission required for enrolment in session 1.

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 (Capstone Project 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. The supervisor will be available for discussion - typically 1 hour per week.

CHNG9406
Chemical Engineering Design B

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** CHNG9402 OR CHNG5112 **Prohibitions:** CHNG5116 **Assumed knowledge:** Enrollment in this unit of study assumes that all core chemical engineering units of study, apart from final year, have been successfully completed. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CHNG5021 and 6cp of recommended electives with CHNG5223 Dissertation B.

Select 12 credit points from Specialist electives/Management electives.

Candidates must complete 24 credit points from Specialisation Electives and 6 credit points from Management Electives across Year Two and Year Three.

Specialist elective units

Candidates must complete 24 credit points from the following Chemical & Biomolecular Specialist elective units.

CHNG5001
Process Systems Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Project Work - in class 2 hrs/week; Project Work - own time 4 hrs/week. **Assumed knowledge:** First year undergraduate physics and mathematics (differential equations). Use of mathematical and/or computer-based modelling tools and techniques. Feedback control concepts and principles as taught in CHNG3802/CHNG5802 or similar courses. Students who are unsure about meeting these requirements should contact the unit coordinator for advice. **Assessment:** Through semester assessment (100%) **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:** Meeting 4 hrs/week. **Assumed knowledge:** CHNG3801 AND CHNG3802 AND CHNG3803 AND CHNG3805 AND CHNG3806 AND CHNG3807. All core third year chemical engineering. **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/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. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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. This UoS is an advanced Chemical Engineering elective.

CHNG5005
Wastewater Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Group assignment 2 hrs/week; Site Visit 5 hrs/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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to acquaint students with the application of chemical engineering concepts and practice in an environmental context, the important example of wastewater treatment will be explored.

The key issues that will be considered are: Wastewater creation and characterisation; Wastewater treatment costs; Primary, secondary and tertiary treatment options; High-rate anaerobic and aerobic treatment options; Sludge management and water recovery/reuse options; Process integration considerations.

By the end of this UOS, a student should have gained an engineering-based appreciation of the technical, economic and social challenges posed by wastewater generation and its cost-effective treatment.

This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught here are relevant to the real-world practice of chemical engineering across a broad range of industries.

CHNG5006
Advanced Wastewater Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** CHNG5005 OR CHNG3804. **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study addresses inter-related issues relevant to wastewater treatment including: (i) the diverse nature of wastewater and its characteristics; (ii) an overview of conventional wastewater treatment options; (iii) the use of commercial software in designing and evaluating a range of advanced wastewater treatment options including biological nutrient removal; (iv) the potential role of constructed wetlands in domestic and industrial wastewater treatment; (v) wastewater management in the food processing, resources, and coal seam gas production industries; (vi) researching advanced wastewater treatment options.

CHNG5008
Nanotechnology in Chemical Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time 8 hrs/week; Lecture 4 hrs/week. **Prerequisites:** CHNG3801 AND CHNG3802 AND CHNG3805 AND CHNG3806 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Note: School permission required for enrollment.

This course will give students insights into advanced concepts in Chemical and Biomolecular Engineering, which are essential for the design of efficient processes and green products for the sustainable development and minimise or preferably eliminate waste for a clean world. This unit of study will examine cutting edge examples of nano-technology, renewable energy, bio-technology, and other advanced technologies across a broad range of applications relevant to chemical and biomolecular engineering. At the completion of this unit of study students should have developed an appreciation of the underlying concepts 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.

CHNG5601
Membrane Science

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 4 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

"Membrane Science" provides background in the physics and electrochemistry of a variety of synthetic membranes used in industry as well as cellular membranes.

The course aims to provide students with an understand of:

membrane self-assembly and manufacture;

membrane separation processes such as filtration, desalination, ion exchange and water-splitting;

and techniques for membrane characterisation and monitoring.

CHNG5602
Cellular Biophysics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 4 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Project Work - own time 2 hrs/week. **Assumed knowledge:** It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This course is for Master degree students and also is offered as an elective course for fourth year students. Some lectures my be given by a guest lecturer. this

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 Engineering Laboratory

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 4 hrs/week. **Assumed knowledge:** CHNG5601 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This a practical unit of study where students apply the theoretical concepts of membrane science to engineering practice via a series of laboratory experiments. The students will gain practical insights into mass transport processes through various membranes. Students will understand the construction and functional properties of synthetic separation membranes and also will explore experimentally the various factors affecting the performance of membranes.

CHNG5605
Bio-Products: Laboratory to Marketplace

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Project Work - own time 6 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This course is for Master degree students and also is offered as an elective course for fourth year students. .

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.This unit of study is offered as an advanced elective unit of study to final year undergraduate students. Students may be required to attend lectures off-campus.

Management elective units

Candidates must complete 6 credit points from the following Management elective units.

ENGG5203
Quality Engineering and Management

Credit points: 6 **Session:** Semester 2 **Classes:** Presentation 2 hrs/week; Project Work - in class 2 hrs/week; Project Work - own time 6 hrs. **Assumed knowledge:** First degree in Engineering or a related discipline **Assessment:** Through semester assessment (100%) **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 control and management as well as systems assurance processes. 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.

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hrs/week; E-Learning 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.

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 expertis.

ENGG5214
Management of Technology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Uos is designed to develop competence in the management of technology. It will address all aspects of the management of technology, the nature and importance of technological change and innovation, within the context of the global knowledge economy, the management of the new product development process, the role of technology in manufacturing and service competitiveness, the role of IT in logistics management, supply chain strategies, and communication, and the characteristics of high technology markets.

ENGG5215
International Eng Strategy & Operations

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - in class 2 hr/week for half the semester. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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 1 hr/week; Tutorial 1 hr/week; Presentation 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units CHNG5020 and CHNG5022 (total 18 cp) in place of Capstone Project CHNG5021 and 6 cp of elective units.

CHNG5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting 1 hr/week; Project Work - own time 5 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assumed knowledge:** (CHNG9301 OR CHNG5801) AND (CHNG9302 OR CHNG5802) AND (CHNG9303 OR CHNG5803) AND (CHNG9305 OR CHNG5805) AND (CHNG9306 OR CHNG5806). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: School permission required for enrolment in semester 2.

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 (Minimum 12 A and B) run over two semesters. 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.Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week.

CHNG5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting 1 hr/week; Project Work - own time 5 hrs/week. **Corequisites:** CHNG5020 **Assumed knowledge:** Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: School permission required for enrolment in session 1.

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 (Capstone Project 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. The supervisor will be available for discussion - typically 1 hour per week.

CHNG5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** No formal classes **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Corequisites:** CHNG5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: Permission required for semester 1 or 2 based on achievement in Capstone Project A and taking other program requirements into consideration.

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 (Capstone Project A and B/B extended) 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 Capstone Project A will be evaluated based on a seminar presentation and a progress report. The skills acquired will be invaluable to students undertaking engineering work.Students are expected to take the initiative when pursuing their research projects. The supervisor will be available for discussion - typically 1 hour per week. Capstone Project B extended enables the student to undertake a project of greater scope and depth than capstone project B.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units CHNG5222 and CHNG5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

CHNG5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5221, ENGG5220 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 &2

CHNG5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5221, ENGG5220 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 insessions 1 & 2

MIPPS pathway (Major Industrial Project Placement Scheme)

MIPP pathway candidates take CHNG5205 Major Industrial Project Placement (24 credit points) in place of the Engineering Project units (12 credit points) plus CHNG5112 Foundation of Chemical Engineering Design A and one of the electives from the Specialist Units of Study.

CHNG5205
Major Industrial Placement Project

Credit points: 24 **Session:** Semester 1 **Classes:** Professional Placement hours set by supervisor. **Prerequisites:** Passed at least 48 credit points in Master of professional engineering with adequate foundation knowledge in discipline. Students wishing to do this unit of study should contact the Head of School prior to enrolment. **Prohibitions:** : CHNG5112 OR CHNG5020 OR CHNG5021. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Enrolment by permission only. The students enrolled in this subject should have completed 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. Students enrolled in this subject are exempted from completing Chemical Engineering Design A (CHNG9402), Capstone Project A and B (CHNG5020 and CHNG5021) and one of the electives from the Specialist Units of Study that students are expected to take in the first semester of the second year. This exemption is granted because students are exposed to the core aspects of these courses through practical exercises undertaken during the MIPPS placement. While undertaking MIPPS, students have a unique opportunity to see and experience the industrial environment around them, in a manner which is not available at University.MIPPS students are required to enroll in Chemical Engineering Design B (CHNG9406) in the following semester.

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 industry supervision supported by School staff 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.

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Civil Engineering

Course overview

A postgraduate specialisation in Civil Engineering will teach you about planning, designing and testing structures within the built environment.

It is concerned with all types of infrastructures including dams, bridges, pipelines, roads, towers and buildings.

Areas of study include steel/concrete structures, environmental geotechnics, advanced water resources management and numerical methods in engineering.

This degree has been given full accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia.

Course requirements

Candidates for the Master of Professional Engineering (Civil Engineering) complete 144 credit points as listed in the unit of study table.

Candidates also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Civil)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One			
Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
CIVL9110 **Materials**	6	**A** This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. **N** CIVL5501 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 1
CIVL9201 **Structural Mechanics**	6	**A** From Engineering Mechanics, 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. **N** CIVL5502 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 1
CIVL9810 **Engineering Construction and Surveying**	6	**N** CIVL5506 *This UoS includes a 2 day Engineering Construction and Survey Camp where field survey is practised and exercises in the application of field survey to Engineering Construction are also undertaken. The Camp is held 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)*	Semester 1
ENGG9802 **Engineering Mechanics**	6	**N** ENGG5802	Semester 2 Summer Main
Year One - Semester Two			
CIVL9230 **Structural Concepts and Design**	6	**A** Structural mechanics, first year mathematics, but these are not prerequisites **N** CIVL5509 *Basic structural elements include beams, columns slabs and simple frames*	Semester 2
CIVL9410 **Soil Mechanics**	6	**A** CIVL9201 OR CIVL5502. An understanding of simple statics, equilibrium, forces and bending moments, and of stress and strain and the relationship between them. This is covered by University of Sydney courses ENGG9802 Engineering Mechanics, CIVL9201 Structural Mechanics. Familiarity with the use of spreadsheets (Excel, Mathcad) to obtain solutions to engineering problems, and with the graphical presentation of this data. Familiarity with word processing packages for report presentation. Some of this is covered in the University of Sydney course ENGG9801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. **N** CIVL5504 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
CIVL9611 **Introductory Fluid Mechanics**	6	**A** CIVL5502 OR CIVL9201. 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 their analytical and numerical solutions **N** CIVL5505	Semester 2
GEOL1501 **Engineering Geology 1**	6	**A** No previous knowledge of Geology assumed **N** GEOS1903, GEOL1902, GEOS1003, GEOL1002	Semester 2
Year Two - Semester One			
CIVL9205 **Concrete Structures 1**	6	**A** (CIVL5501 OR CIVL9110) AND (CIVL5502 OR CIVL9201) AND (CIVL5509 OR CIVL9230). basic concepts of solid mechanics and structural mechanics, including: compatability of strains; stress-strain relationships; equilibrium; flexure, shear and torsion; statically determinate load effects (reactions, bending moments, shear forces); elastic beam theory (strains, stresses and beam deflections). **N** CIVL5507	Semester 1
CIVL9612 **Fluid Mechanics**	6	**A** (CIVL9201 OR CIVL5502) AND (CIVL9611 OR CIVL5505) AND (ENGG9802 OR ENGG5802). This unit of study follows on from Fluid Mechanics CIVL9611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. **N** CIVL5511	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL9811 **Engineering Design and 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. **N** CIVL5512 *This unit aims to prepare students for employment in a broad range of engineering areas including design, planning and construction management.*	Semester 1
ENGG5204 **Engineering Professional Practice**	6	**A** Competences and experience in engineering obtained during an accepted engineering degree	Semester 1
Year Two - Semester Two			
CIVL9206 **Steel Structures 1**	6	**A** (CIVL9110 OR CIVL5501) AND (CIVL9201 OR CIVL5502) AND (CIVL9230 OR CIVL5509) AND (CIVL9235 OR CIVL5513) **N** CIVL5508 *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. A special "assumed knowledge" lecture will be given in Week 1 to refresh the knowledge of students.*	Semester 2
ENGG5205 **Professional Practice in PM**	6	*This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.*	Semester 1 Semester 2
Select 12 credit points from Civil Electives block.			
Year Three - Semester One			
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5020 and 6cp of recommended electives with CIVL5222 Dissertation A.			
Select 6 credit points from Civil Electives block.			
Select 12 credit points from Civil Advanced electives block.			
Year Three - Semester Two			
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL9903 **Civil Engineering Design**	6	**A** CIVL9410 AND CIVL9612 AND CIVL9811 **P** (CIVL9205 OR CIVL5507) AND (CIVL9206 OR CIVL5508) **N** CIVL5510	Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5021 and 6cp of recommended electives with CIVL5223 Dissertation B.			
Select 12 credit points from Civil Advanced electives block.			
Elective units Candidates must complete 18 credit points from the following Elective units of study.			
CIVL5266 **Steel Structures - Stability**	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis.	Semester 1
CIVL5269 **Concrete Structures - Strength & Service**	6	**P** CIVL3205 OR CIVL5507 OR CIVL9205	Semester 2
CIVL5351 **Geoenvironmental Engineering**	6		Semester 1
CIVL5452 **Foundation Engineering**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity)	Semester 1
CIVL5458 **Numerical Methods in Civil Engineering**	6		Semester 1
CIVL5665 **Advanced Water Resources Management**	6	**A** CIVL3612	Semester 2
CIVL5670 **Reservoir Stream & Coastal Eng**	6	**A** CIVL3612 and MATH2061.	Semester 1
CIVL9235 **Structural Analysis**	6	**A** This unit of study assumes previous study of the fundamental principles of structural mechanics obtained from CIVL9201 Foundations of Structural Mechanics or equivalent introductory structural mechanics subject. **N** CIVL5513	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL9411 **Geotechnical Engineering**	6	**A** Fundamentals of soil mechanics including effective stress, pore pressure, consolidation and seepage. **N** CIVL5514	Semester 2
CIVL9614 **Hydrology**	6	**A** (ENGG9802 OR ENGG5802) AND (CIVL9612 OR CIVL5511) AND MATH2061 **P** CIVL9611 OR CIVL5505 **N** CIVL5503 *The unit of study builds on the theory and concepts learnt in CIVL5505 Foundations of Introductory Fluid Mechanics and CIVL5511 Foundations of Fluid Mechanics.*	Semester 2

Advanced Elective units

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
CHNG5005 **Wastewater Engineering**	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 1
CHNG5006 **Advanced Wastewater Engineering**	6	**A** CHNG5005 OR CHNG3804.	Semester 2
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	**A** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis.	Semester 2
CIVL5450 **Analysis and Design of Pile Foundations**	6		Semester 1
CIVL5451 **Computer Methods in Geotechnical Eng** *This unit of study is not available in 2015*	6		Semester 1
CIVL5453 **Geotechnical Hazards**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity).	Semester 2
CIVL5454 **Rock Engineering**	6	**A** Undergraduate geology and soil mechanics	Semester 2
CIVL5455 **Engineering Behaviour of Soils**	6	**A** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential.	Semester 2
CIVL5666 **Open Channel Flow & Hydraulic Structures**	6	**A** Advanced knowledge of fluid mechanics is necessary for this UoS.	Semester 1
CIVL5668 **Wind Engineering for Design-Fundamentals**	6		Semester 1
CIVL5669 **Applied Fluid Engineering Computing**	6	**A** CIVL5511 or CIVL9612. 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

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.

Extended Capstone Project candidates take Capstone Project units CIVL5020 and CIVL5022 (total 18 cp) in place of Capstone Project CIVL5021 and 6 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.

Research pathway candidates take Dissertation units CIVL5222 and CIVL5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5222 **Dissertation A**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5223 **Dissertation B**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
Exchange units Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.			
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Civil)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

CIVL9110
Materials

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 3 hours per week; Tutorial: 2 hours per week; Laboratory: 2 hours per semester. **Prohibitions:** CIVL5501 **Assumed knowledge:** This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. **Assessment:** Through semester assessment (60%), Final Exam (40%) **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.

CIVL9201
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:** CIVL5502 **Assumed knowledge:** From Engineering Mechanics, 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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

CIVL9810
Engineering Construction and 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. **Prohibitions:** CIVL5506 **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This UoS includes a 2 day Engineering Construction and Survey Camp where field survey is practised and exercises in the application of field survey to Engineering Construction are also undertaken. The Camp is held 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)

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.

ENGG9802
Engineering Mechanics

Credit points: 6 **Session:** Semester 2, Summer Main **Classes:** 2 hrs Lectures per week, 3hrs tutorial per week **Prohibitions:** ENGG5802 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to provide students with an understanding of and competence in solving statics and introductory dynamics 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. Introduction to kinematics and dynamics topics includes position, velocity and acceleration of a point; relative motion, force and acceleration, momentum, collisions and energy methods.

Year One - Semester Two

CIVL9230
Structural Concepts and Design

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** CIVL5509 **Assumed knowledge:** Structural mechanics, first year mathematics, but these are not prerequisites **Assessment:** Through semester assessment (25%), Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Basic structural elements include beams, columns slabs and simple frames

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.

CIVL9410
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:** CIVL5504 **Assumed knowledge:** CIVL9201 OR CIVL5502. An understanding of simple statics, equilibrium, forces and bending moments, and of stress and strain and the relationship between them. This is covered by University of Sydney courses ENGG9802 Engineering Mechanics, CIVL9201 Structural Mechanics. Familiarity with the use of spreadsheets (Excel, Mathcad) to obtain solutions to engineering problems, and with the graphical presentation of this data. Familiarity with word processing packages for report presentation. Some of this is covered in the University of Sydney course ENGG9801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

CIVL9611
Introductory Fluid Mechanics

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. 1 hour of laboratory work per semester. **Prohibitions:** CIVL5505 **Assumed knowledge:** CIVL5502 OR CIVL9201. 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 their analytical and numerical solutions **Assessment:** Through semester assessment (50%), Final Exam (50%) **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 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.

GEOL1501
Engineering Geology 1

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2 **Classes:** Two 2 hour lectures per week and 24 hours laboratory classes. **Prohibitions:** GEOS1903, GEOL1902, GEOS1003, GEOL1002 **Assumed knowledge:** No previous knowledge of Geology assumed **Assessment:** Practical laboratory work, Assignments, Tests and Quizzes, and a combined theory and practical exam (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Course objectives: To introduce basic geology and the principles of site investigation to civil engineering students. Expected outcomes: Students should develop an appreciation of geologic processes and their influence civil engineering works, acquire knowledge of the most important rocks and minerals and be able to identify them, and interpret geological maps with an emphasis on making construction decisions. Syllabus summary: Geological concepts relevant to civil engineering and the building environment. Introduction to minerals; igneous, sedimentary and metamorphic rocks, their occurrence, formation and significance. General introduction to physical geology and geomorphology, structural geology, plate tectonics, hydrogeology, rock core logging site investigation techniques for construction. Associated laboratory work on minerals, rocks and mapping.

Textbooks

Portrait of A Planet by Stephen Marshak, Published by H.H. Norton and Company and readings provided via Blackboard

Year Two - Semester One

CIVL9205
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. **Prohibitions:** CIVL5507 **Assumed knowledge:** (CIVL5501 OR CIVL9110) AND (CIVL5502 OR CIVL9201) AND (CIVL5509 OR CIVL9230). basic concepts of solid mechanics and structural mechanics, including: compatability of strains; stress-strain relationships; equilibrium; flexure, shear and torsion; statically determinate load effects (reactions, bending moments, shear forces); elastic beam theory (strains, stresses and beam deflections). **Assessment:** Through semester assessment (60%), Final Exam (40%) **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.

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.

CIVL9612
Fluid Mechanics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2hrs per week, Tutorial 2hrs per week, Laboratory 4.5 hrs per semester. **Prohibitions:** CIVL5511 **Assumed knowledge:** (CIVL9201 OR CIVL5502) AND (CIVL9611 OR CIVL5505) AND (ENGG9802 OR ENGG5802). This unit of study follows on from Fluid Mechanics CIVL9611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. **Assessment:** Through semester assessemnt (60%), Final Exam (40%) **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.

CIVL9811
Engineering Design and Construction

Credit points: 6 **Session:** Semester 1 **Classes:** Workshop 3 hours per week. Lecture/Presentation 2 hrs per week, **Prohibitions:** CIVL5512 **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. **Assessment:**

Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit aims to prepare students for employment in a broad range of engineering areas including design, planning and construction management.

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 CIVL9810 (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; timber engineeering; post-tensioned/prestressed concrete construction; civil engineering in a marine environment; insurance in the construction industry; occupational health and safety issues in the construction industry.

On day 1 of the course, a form based survey is taken to invite students to nominate specific areas of interest which may lead to adjustment in course content.

ENGG5204
Engineering Professional Practice

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Competences and experience in engineering obtained during an accepted engineering degree **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This UoS is designed to provide graduate engineers studying for a Master of Professional Engineering degree 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, basic knowledge of the law of contracts and legal responsibility, 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.

Year Two - Semester Two

CIVL9206
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. **Prohibitions:** CIVL5508 **Assumed knowledge:** (CIVL9110 OR CIVL5501) AND (CIVL9201 OR CIVL5502) AND (CIVL9230 OR CIVL5509) AND (CIVL9235 OR CIVL5513) **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: 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. A special "assumed knowledge" lecture will be given in Week 1 to refresh the knowledge of students.

Students should refer to the printed version of the unit outline distributed in lecture 1.

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.

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hrs/week; E-Learning 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.

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 expertis.

Select 12 credit points from Civil Electives block.

Year Three - Semester One

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5020 and 6cp of recommended electives with CIVL5222 Dissertation A.

Select 6 credit points from Civil Electives block.

Select 12 credit points from Civil Advanced electives block.

Year Three - Semester Two

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL9903
Civil Engineering Design

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures and 3 hours of tutorials per week. **Prerequisites:** (CIVL9205 OR CIVL5507) AND (CIVL9206 OR CIVL5508) **Prohibitions:** CIVL5510 **Assumed knowledge:** CIVL9410 AND CIVL9612 AND CIVL9811 **Assessment:** Through semester assessment (75%), Final Exam (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5021 and 6cp of recommended electives with CIVL5223 Dissertation B.

Select 12 credit points from Civil Advanced electives block.

Elective units

Candidates must complete 18 credit points from the following Elective units of study.

CIVL5266
Steel Structures - Stability

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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.

CIVL5269
Concrete Structures - Strength & Service

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** CIVL3205 OR CIVL5507 OR CIVL9205 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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). Strut-and-tie modelling of reinforced concrete members is also described. Design guidelines will reflect requirements of the Australian Standards and Eurocodes.

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;

- ability to use strut-and-tie models of reinforced concrete behaviour.

CIVL5351
Geoenvironmental Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **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.

Learning Outcomes: 1. Analyse flow regime in soil using Darcy equation; 2. Analyse contaminant migration in soil using coupled flow and reactive diffusion advection equations; 3. Design a single or double composite landfill liner satisfying groundwater quality requirements; 4. Predict the potential for methane production in a landfill and assess the feasibility of waste-to-energy conversion; 5. Conduct research on a geoenvironmental topic as part for group.

Syllabus Summary: introduction to geoenvironmental engineering; integrated waste management and life cycle assessment; soil composition and mineralogy; types and characteristics of contaminants; theory of water seepage in soil and hydraulic conductivity; theory of reactive contaminant transport in soil including molecular diffusion, mechanical dispersion and advective flow; analytical and numerical solutions of reactive diffusion advection equation; design of landfills; geosynthetics and geomembranes; defects and leakage rates; methane generation in landfills and landfill gas management.

CIVL5452
Foundation Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 3 hrs per week, presented in 2 sessions per week for 11 weeks of semester. Tutorials 1hr per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity) **Assessment:** Through semester assessment (100%) **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.

CIVL5458
Numerical Methods in Civil Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives:

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.

CIVL5665
Advanced Water Resources Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL3612 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit of study is to introduce students and professionals to water resources engineering. The aim of this unit is to provide an understanding of: hydrologic cycle from the broadest perspective, physical, chemical and biological characterization of water, how to change the water quality parameters, water quality control and management, water quality in the environment, nutrient and contaminant cycling and removal, water treatment methods for drinking, wastewater and groundwater, conservation/reuse/treatment techniques, desalination, stormwater, bioremediation and phytoremediation techniques. The topics mentioned above will be covered in both a qualitative and quantitative aspects. A basic level of integral and differential calculus is required as well as knowledge and use of calculation software such as Excell and Matlab.

CIVL5670
Reservoir Stream & Coastal Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs/week; Tutorials 2 hrs/week. **Assumed knowledge:** CIVL3612 and MATH2061. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

(Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)

CIVL9235
Structural Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 4 hours per week, Tutorial 2 hours per week. **Prohibitions:** CIVL5513 **Assumed knowledge:** This unit of study assumes previous study of the fundamental principles of structural mechanics obtained from CIVL9201 Foundations of Structural Mechanics or equivalent introductory structural mechanics subject. **Assessment:** Through semester assessment (65%), Final Exam (35%) **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.

CIVL9411
Geotechnical Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs per week, Tutorial 2 hrs per week. **Prohibitions:** CIVL5514 **Assumed knowledge:** Fundamentals of soil mechanics including effective stress, pore pressure, consolidation and seepage. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

CIVL9614
Hydrology

Credit points: 6 **Session:** Semester 2 **Classes:** 2hr lectures per week, 2hr tutorials per week. **Prerequisites:** CIVL9611 OR CIVL5505 **Prohibitions:** CIVL5503 **Assumed knowledge:** (ENGG9802 OR ENGG5802) AND (CIVL9612 OR CIVL5511) AND MATH2061 **Assessment:** Through semester assessment(50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The unit of study builds on the theory and concepts learnt in CIVL5505 Foundations of Introductory Fluid Mechanics and CIVL5511 Foundations of Fluid Mechanics.

The overall objective of this unit of study is to give a general introduction to water resources, how these are linked to the hydrological processes, and how engineering plays a role in the management of water resources. The aim of this unit is to provide a detailed understanding of: the hydrologic cycle of water as a whole and its specific components including: geophysical flows of water throughout the environment, dynamics of precipitation formations, transformations into runoff, reservoir and lake dynamics, stream flow discharge, surface runoff assessment, calculation of peak flows, the hydrograph theory, ground water flows, aquifers dynamics, concept of water quality and water treatment methods and units. The topics mentioned above will be covered in both qualitative and quantitative aspects. Use will be made of essential concepts of energy, mass and momentum conservation. An intermediate level of integral and differential calculus is required as well as knowledge and use of calculation software such as Excel and Matlab.

Advanced Elective units

Candidates must complete 24 credit points from the following Advanced elective units of study.

CHNG5005
Wastewater Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Group assignment 2 hrs/week; Site Visit 5 hrs/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.

Assessment: Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to acquaint students with the application of chemical engineering concepts and practice in an environmental context, the important example of wastewater treatment will be explored.

The key issues that will be considered are: Wastewater creation and characterisation; Wastewater treatment costs; Primary, secondary and tertiary treatment options; High-rate anaerobic and aerobic treatment options; Sludge management and water recovery/reuse options; Process integration considerations.

By the end of this UOS, a student should have gained an engineering-based appreciation of the technical, economic and social challenges posed by wastewater generation and its cost-effective treatment.

This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught here are relevant to the real-world practice of chemical engineering across a broad range of industries.

CHNG5006
Advanced Wastewater Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** CHNG5005 OR CHNG3804. **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study addresses inter-related issues relevant to wastewater treatment including: (i) the diverse nature of wastewater and its characteristics; (ii) an overview of conventional wastewater treatment options; (iii) the use of commercial software in designing and evaluating a range of advanced wastewater treatment options including biological nutrient removal; (iv) the potential role of constructed wetlands in domestic and industrial wastewater treatment; (v) wastewater management in the food processing, resources, and coal seam gas production industries; (vi) researching advanced wastewater treatment options.

CIVL5257
Concrete Structures: Prestressed

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - in class 1 hr/week; Project Work - own time 3 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

CIVL5264
Composite Steel-Concrete Structures

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students will understand the basic principles for the design of composite steel-concrete structures. In particular, they will develop an understanding of the procedures required for the design of composite beams, slabs and columns. Design guidelines will reflect requirements of the Australian Standards and international codes.

CIVL5267
Steel Structures - Advanced Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 as well as international standards, 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, AS/NZS4600, AISC-LRFD, BS5950 and GB50017 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.

CIVL5268
Structural Dynamics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis. **Assessment:** Through semester assessment (65%) Final Exam (35%) **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 (SDOF) 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 Parts4 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

* Ability to apply AS1170 Part 4 in structural design against earthquake actions

* Understanding of the fundamental concepts of earthquake engineering

CIVL5450
Analysis and Design of Pile Foundations

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week; Project Work - own time 6 hrs/week; Laboratory 3 hrs/week. **Assessment:** Through semester assessment (100%) **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.

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

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (100%) **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.

CIVL5453
Geotechnical Hazards

Credit points: 6 **Teacher/Coordinator:** Pierre Rognon **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 1 hour per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity). **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Geotechnical flows include landslides, rock falls and mud flows. They are triggered by soil failure due to natural or human causes. The objective of this Unit of Study is to develop the ability to assess and mitigate the risks associated to such events. Students will learn how to estimate when and where these events are likely to occur, how to define safety zones and how to design effective protection structures. The syllabus is comprised of (i) Landslide Risk Assessment and Management procedures (ii) post-faillure and out of equilibrium soil mechanics applied to prediction of rock fall, landslide and mud flow run-out distance and impact force on structures; (iii) design of geotechnical protection structures.

CIVL5454
Rock Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Laboratory 3 hrs/week. **Assumed knowledge:** Undergraduate geology and soil mechanics **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives: to develop an understanding of the behaviour and design of engineering structures in rock masses

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.

CIVL5455
Engineering Behaviour of Soils

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential. **Assessment:** Through semester assessment (100%) **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.

CIVL5666
Open Channel Flow & Hydraulic Structures

Credit points: 6 **Session:** Semester 1 **Assumed knowledge:** Advanced knowledge of fluid mechanics is necessary for this UoS. **Assessment:** Through semester assessment (100%) **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.

CIVL5668
Wind Engineering for Design-Fundamentals

Credit points: 6 **Session:** Semester 1 **Assessment:** Through semester assessment (60%) Final Exam (40%) **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, dynamic response of structures, and how all the above relates to AS1170.2.

CIVL5669
Applied Fluid Engineering Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **Assumed knowledge:** CIVL5511 or CIVL9612. 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit is to provide students with advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving thermal fluid 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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units CIVL5020 and CIVL5022 (total 18 cp) in place of Capstone Project CIVL5021 and 6 cp of elective units.

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

Capstone Project 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 Capstone Project course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021) or this unit Capstone Project B extended (CIVL5022) worth 12 credit points. This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units CIVL5222 and CIVL5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

CIVL5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

CIVL5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Electrical Engineering

Course overview

A postgraduate specialisation in Electrical Engineering is concerned with the way electrical energy is produced and used in homes, the community and industry.

It will provide you with advanced knowledge in designing and building systems and machines that generate, transmit, measure, control and use electrical energy essential to modern life.

Areas of study include wireless engineering, power engineering, high voltage engineering and digital integrated circuit design.

This degree has been given full accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia.

Course requirements

Candidates for the Master of Professional Engineering (Electrical Engineering) complete 144 credit points as listed in the unit of study table.

Candidates also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Electrical)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One			
Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
COMP9129 **Software Construction**	6	**A** Some prior knowledge of programming is preferred; for students without programming experience, extra assistance is given in the first 6 weeks of the semester. **N** COMP5212	Semester 1
ELEC9703 **Fundamentals of Elec and Electronic Eng**	6	**A** Basic knowledge of differentiation & integration, and HSC Physics **N** ELEC5710	Semester 1
ELEC9602 **Digital Logic**	6	**A** This unit of study assumes some knowledge of digital data representation and basic computer organisation. **N** ELEC5722	Semester 1
ENGG5011 **Foundation Engineering Studies A**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Main
Year One - Semester Two			
ELEC9103 **Simulations and Numerical Solutions in Eng**	6	**A** ELEC9703. Understanding of the fundamental concepts and building blocks of electrical and electronics circuits and aspects of professional project management, teamwork, and ethics. **N** : ELEC5723 OR ELEC2103 OR COSC1001 OR COSC1901	Semester 2
ELEC9302 **Signals and Systems**	6	**A** Basic knowledge of differentiation & integration, differential equations, and linear algebra. **N** ELEC5721	Semester 2
ELEC9601 **Computer Systems**	6	**A** HSC Mathematics extension 1 or 2 **N** ELEC5711	Semester 2
ELEC9704 **Electronic Devices and Circuits**	6	**A** 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. **N** : ELEC5720 OR ELEC2104	Semester 2
Year Two - Semester One			
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5204 **Engineering Professional Practice**	6	**A** Competences and experience in engineering obtained during an accepted engineering degree	Semester 1
Select 12 credit points from the Foundation units block. Candidates complete 24 credit points of Foundation units across Year Two.			
Year Two - Semester Two			
Select 12 credit points from Foundation units block. Candidates complete 24 credit points of Foundation units across Year Two			
Select 12 credit points from Electrical Electives or Management Electives units block. Candiates complete 36 credit points of Electrical Electives and 12 credit points of Management Electives across Year Two and Year Three.			
Year Three - Semester One			
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5020 and 6cp of recommended electives with ELEC5222 Dissertation A.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Select 18 credit points from Electrical Electives or Management Electives units block.			
Candiates complete 36 credit points of Electrical Electives and 12 credit points of Management Electives across Year Two and Year Three.			
Year Three - Semester Two			
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5021 and 6cp of recommended electives with ELEC5223 Dissertation B.			
Select 18 credit points from Electrical Electives or Management Electives units block.			
Candiates complete 36 credit points of Electrical Electives and 12 credit points of Management Electives across Year Two and Year Three.			
Foundation units			
Candidates must complete 24 credit points from the following Foundation units of study.			
ELEC9104 **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** ELEC5730	Semester 1
ELEC9203 **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** ELEC3203 OR ELEC5732	Semester 1
ELEC9204 **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. **N** ELEC5733	Semester 1
ELEC9206 **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. **N** ELEC5734	Semester 2
ELEC9304 **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. **N** ELEC5735	Semester 2
ELEC9305 **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** ELEC5736	Semester 1
ELEC9404 **Electronic Circuit Design**	6	**A** A background in basic electronics and circuit theory is assumed. **N** ELEC5737	Semester 1
ELEC9405 **Communications Electronics and Photonics**	6	**A** A background in basic electronics and circuit theory is assumed. **N** ELEC5738	Semester 2
ELEC9505 **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** ELEC5739	Semester 1
ELEC9506 **Data Communications and the Internet**	6	**N** ELEC5740	Semester 2
ELEC9515 **Digital Communication Systems**	6	**N** ELEC5744	Semester 1
ELEC9607 **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** ELEC5741	Semester 1
ELEC9609 **Internet Software Platforms**	6	**N** ELEC5742	Semester 2
ELEC9610 **E-Business Analysis and Design**	6	**A** Basic knowledge of Database Management Systems **P** INFO9120	Semester 1
Electrical Elective units			
Candidates must complete 36 credit points from the following Electrical Elective units of study.			
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	Semester 1
ELEC5101 **Antennas and Propagation**	6		Semester 2
ELEC5203 **Topics in Power Engineering**	6	**A** ELEC3203 Power Engineering and ELEC3204 Power Electronics and Drives.Familiarity with basic mathematics and physics; competence with basic circuit theory and understanding of electricity grid equipment such as transformers, transmission lines and associated modeling; and fundamentals of power electronic technologies.	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.	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. **P** ELEC3203 OR ELEC9203	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
ELEC5207 **Advanced Power Conversion Technologies**	6	**A** ELEC3204	Semester 2
ELEC5208 **Intelligent Electricity Networks**	6	**A** Fundamentals of Electricity Networks, Control Systems and Telecommunications	Semester 1
ELEC5211 **Power Systems Dynamics and Control**	6	**A** The pre-required knowledge for learning this UoS is a deep understanding on circuit analysis and its applications in power system steady state analysis. **P** ELEC3203 OR ELEC9203 OR ELEC5732	Semester 1
ELEC5212 **Power Systems Planning and Markets**	6	**A** The pre-required knowledge for learning this UoS is power system steady state analysis **P** ELEC3203 OR ELEC9203	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. *Note: Department permission required for enrolment*	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.	Semester 1
ELEC5507 **Error Control Coding**	6	**A** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired.	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
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.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	Semester 2
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3305, ELEC3506, ELEC3607 and ELEC5508	Semester 2
ELEC5516 **Electrical and Optical Sensor Design**	6	**A** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis	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) **N** MECH5701	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2
ELEC5701 **Technology Venture Creation**	6	**N** ENGG5102	Semester 2
ELEC5803 **Advanced Bioelectronics**	6	**A** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **P** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) *Note: Department permission required for enrolment*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Management Elective units			
Candidates must complete 12 credit points from the following Management Elective units of study.			
ENGG5203 **Quality Engineering and Management**	6	**A** First degree in Engineering or a related discipline	Semester 2
ENGG5205 **Professional Practice in PM**	6	*This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.*	Semester 1 Semester 2
ENGG5214 **Management of Technology**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
ENGG5215 **International Eng Strategy & Operations**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
ENGG5216 **Management of Engineering Innovation**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 1
Project units			
All candidates are required to complete a minimum of 12 credit points of Project units. Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. Extended Capstone Project candidates take Capstone Project units ELEC5020 and ELEC5022 (total 18 cp) in place of Capstone Project ELEC5021 and 6 cp of elective units.			
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
ELEC5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption *Note: Department permission required for enrolment*	Semester 1 Semester 2
Research pathway			
Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway. Research pathway candidates take Dissertation units Research pathway students take Dissertation units ELEC5222 and ELEC5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.			
ELEC5222 **Dissertation A**	12	**N** ENGG5222, ELEC8902, ENGG5223, ELEC8901 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
ELEC5223 **Dissertation B**	12	**N** ELEC8901, ELEC8902, ENGG5223, ENGG5222 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
Exchange units			
Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.			
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Electrical)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

COMP9129
Software Construction

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Laboratory: 1 hours per week **Prohibitions:** COMP5212 **Assumed knowledge:** Some prior knowledge of programming is preferred; for students without programming experience, extra assistance is given in the first 6 weeks of the semester. **Assessment:** Through semester assessments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a programming unit of study that is designed to enable students, coming from any background, to learn to program in the C language, with emphasis on the individual producing code that works correctly. as a gentler start to C itself, the unit starts with Python, introducing the same core ideas. Once students have mastered this, we move to C, tackling the same deep ideas in the context of the much more difficult programming in C.

Topics include: 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.

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.

ELEC9703
Fundamentals of Elec and Electronic Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 3 hours per week; Laboratory: 3 hours per week; Tutorial: 2 hours per week **Prohibitions:** ELEC5710 **Assumed knowledge:** Basic knowledge of differentiation & integration, and HSC Physics **Assessment:** Through semester assessment (40%), Final Exam (60%) **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

ELEC9602
Digital Logic

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures, 2 hours of tutorials and 3 hours of laboratory work per week. **Prohibitions:** ELEC5722 **Assumed knowledge:** This unit of study assumes some knowledge of digital data representation and basic computer organisation. **Assessment:** Through semester assessment (30%), Final Exam (70%) **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.

ENGG5011
Foundation Engineering Studies A

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Main **Classes:** Project Work - own time 8 hrs. **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

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.

Year One - Semester Two

ELEC9103
Simulations and Numerical Solutions in Eng

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hours per week, Laboratory 3 hours per week. **Prohibitions:** : ELEC5723 OR ELEC2103 OR COSC1001 OR COSC1901 **Assumed knowledge:** ELEC9703. Understanding of the fundamental concepts and building blocks of electrical and electronics circuits and aspects of professional project management, teamwork, and ethics. **Assessment:** Through semester assesment (25%), Final Exam (75%) **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.

ELEC9302
Signals and Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 1 hours per week; Laboratory: 2 hours per week; Tutorial: 2 hours per week; E-Learning: 1 hours per week **Prohibitions:** ELEC5721 **Assumed knowledge:** Basic knowledge of differentiation & integration, differential equations, and linear algebra. **Assessment:** Through semester assessment (30%), Final Exam (70%) **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.

ELEC9601
Computer Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 3 hours per week; Tutorial: 2 hours per week **Prohibitions:** ELEC5711 **Assumed knowledge:** HSC Mathematics extension 1 or 2 **Assessment:** Through semesteer assessment (59%), Final Exam (41%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces the fundamental digital concepts upon which the design and operation of modern digital computers are based. A prime aim of the unit is to develop a professional view of, and a capacity for inquiry into, the field of computing.

Topics covered include: data representation, basic computer organisation, the CPU, elementary gates and logic, peripheral devices, software organisation, machine language, assembly language, operating systems, data communications and computer networks.

ELEC9704
Electronic Devices 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:** : ELEC5720 OR ELEC2104 **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. **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 ELEC9703 is assumed.

Year Two - Semester One

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5204
Engineering Professional Practice

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Competences and experience in engineering obtained during an accepted engineering degree **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This UoS is designed to provide graduate engineers studying for a Master of Professional Engineering degree 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, basic knowledge of the law of contracts and legal responsibility, 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.

Select 12 credit points from the Foundation units block.

Candidates complete 24 credit points of Foundation units across Year Two.

Year Two - Semester Two

Select 12 credit points from Foundation units block.

Candidates complete 24 credit points of Foundation units across Year Two

Select 12 credit points from Electrical Electives or Management Electives units block.

Candiates complete 36 credit points of Electrical Electives and 12 credit points of Management Electives across Year Two and Year Three.

Year Three - Semester One

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5020 and 6cp of recommended electives with ELEC5222 Dissertation A.

Select 18 credit points from Electrical Electives or Management Electives units block.

Candiates complete 36 credit points of Electrical Electives and 12 credit points of Management Electives across Year Two and Year Three.

Year Three - Semester Two

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5021 and 6cp of recommended electives with ELEC5223 Dissertation B.

Select 18 credit points from Electrical Electives or Management Electives units block.

Candiates complete 36 credit points of Electrical Electives and 12 credit points of Management Electives across Year Two and Year Three.

Foundation units

Candidates must complete 24 credit points from the following Foundation units of study.

ELEC9104
Engineering Electromagnetics

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours tutorial per week. **Prohibitions:** ELEC5730 **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. **Assessment:** Through semester assessment (30%), Final Exam (70%) **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.

ELEC9203
Electricity Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; Laboratory: 3 hours per week **Prohibitions:** ELEC3203 OR ELEC5732 **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. **Assessment:** Through semester assessment (60%), Final Exam (40%) **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 conditions. Transmission lines: calculation of parameters, modelling, analysis. Transformers: construction, equivalent circuits. Generators: construction, modelling for steady state operation. The use of per unit system. The analysis of systems with a number of voltage levels. The load flow problem: bus and impedance matrices, solution methods. Power system transient stability. The control of active and reactive power. Electricity markets, market structures and economic dispatch. Types of electricity grids, radial, mesh, networks. Distribution systems and smart grids.

ELEC9204
Power Electronics and Applications

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Laboratory: 3 hours per week; Tutorial: 2 hours per week. **Prohibitions:** ELEC5733 **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. **Assessment:** Through semester assessment (45%), Final Exam (55%) **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.

ELEC9206
Electrical Energy Conversion Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; Laboratory: 3 hours per week **Prohibitions:** ELEC5734 **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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

ELEC9304
Control

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and a 3 hours lab/tutorial per week. **Prohibitions:** ELEC5735 **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. **Assessment:** Through semester assessment (43%), Final Exam (57%) **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

ELEC9305
Digital Signal Processing

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours lab/tutorial per week. **Prohibitions:** ELEC5736 **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. **Assessment:** Through semester assessment (43%), Final Exam (57%) **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.

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

ELEC9404
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:** ELEC5737 **Assumed knowledge:** A background in basic electronics and circuit theory is assumed. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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. 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.

ELEC9405
Communications Electronics and Photonics

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 3 hours lab/tutorial per week. **Prohibitions:** ELEC5738 **Assumed knowledge:** A background in basic electronics and circuit theory is assumed. **Assessment:** Through semester assessment (25%), Final Exam (75%) **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.

ELEC9505
Communications

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 3 hours lab and tutorial per week. **Prohibitions:** ELEC5739 **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. **Assessment:** Through semester assessment (45%), Final Exam (55%) **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.

ELEC9506
Data Communications and 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:** ELEC5740 **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.).

ELEC9515
Digital Communication Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours lab/tutorial per week. **Prohibitions:** ELEC5744 **Assessment:** Through semester assessment (45%), Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lecture starts with an overview of major components of a digital communication system and current technology. Then the following knowledge will be covered: efficient coding/representation of information source, channel coding of information to combat noise and interference, optimal received design, principles of incoherent systems, error probability calculations, solutions to problems caused by transmitting a signal through a bandlimited channel and caused by multipath, and spread spectrum systems. The lecture concludes with a discussion of future directions of digital communication systems.

ELEC9607
Embedded Computing

Credit points: 6 **Session:** Semester 1 **Classes:** 1 hour of lectures per week and 10 three hour labs. **Prohibitions:** ELEC5741 **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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

ELEC9609
Internet Software Platforms

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours lecture and 2 hours tutorials per week **Prohibitions:** ELEC5742 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

ELEC9610
E-Business Analysis and Design

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours project work in class and 1 hour tutorial per week. **Prerequisites:** INFO9120 **Assumed knowledge:** Basic knowledge of Database Management Systems **Assessment:** Through semester assessment (40%), Final Exam(30%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit examines the essential pre-production stages of designing successful internet websites and services. It focuses on the aspects of analysis, project specification, design, and prototype that lead up to the actual build of a website or application. Topics include, B2C, B2B and B2E systems, business models, methodologies, modeling with use cases / UML and WebML, the Project Proposal and Project Specification Document, Information Architecture and User-Centred Design, legal issues, and standards-based web development. Students build a simple use-case based e-business website prototype with web standards. A final presentation of the analysis, design and prototype are presented in a role play environment where students try to win funding from a venture capitalist. An understanding of these pre-production fundamentals is critical for future IT and Software Engineering Consultants, Project Managers, Analysts and CTOs.

Electrical Elective units

Candidates must complete 36 credit points from the following Electrical Elective units of study.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

COMP5416
Advanced Network Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:**

Through semester assessment (40%) Final Exam (60%) **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.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

ELEC5101
Antennas and Propagation

Credit points: 6 **Session:** Semester 2 **Classes:** Laboratory 3 hrs/week; Lecture 2 hrs/week; Independent Study, **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The basics of antenna radiation are introduced with emphasis on the important performance characteristics of the radiation field pattern (in 3 dimensions) and feed impedance. The omnidirectional and Hertzian dipole antennas (both hypothetical in practise but robust theoretically) provide the starting point to analyse real antenna operation. Mutual coupling between close antennas and important 'ground' imaging effects lead to the design of antenna arrays to increase gain and directivity. Aperture antennas and frequency broadbanding techniques are introduced. Ionospheric propagation is discussed and also the the reception efficiency of receiving antennas which allows consideration of a Transmitter - Receiver 'Link budget'. The important 'Pocklington' equation for a wire dipole is developed from Maxwell's equations and leads to the numerical analysis of wire antennas using 'Moment' methods. Real world applications are emphasised throughout and are reinforced by the hands on laboratory program which includes design projects.

ELEC5203
Topics in Power Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial-Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3203 Power Engineering and ELEC3204 Power Electronics and Drives.Familiarity with basic mathematics and physics; competence with basic circuit theory and understanding of electricity grid equipment such as transformers, transmission lines and associated modeling; and fundamentals of power electronic technologies. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides the basis for the analysis of electricity grids using symmetrical components theory. Such analysis theory is the basis for the understanding of electrical faults and the design of protection strategies to safeguard the electrical equipment, and maintain safety of the plant at the highest possible level.

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:** Lecture 2 hrs/week; Tutorial - Laboratory 2 hrs/week; Project Work - in class 2 hrs. **Prerequisites:** ELEC3203 OR ELEC9203 **Assumed knowledge:** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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:** Lecture 2 hrs/week; Tutorial 2 hrs/fortnight; Laboratory 2 hrsfortnight; Project Work - own time 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 power system both at distribution and transmission levels. 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 intelligent electricity networks and advanced energy conversion and power systems. The following topics are covered: modern power systems; distributed generation; co-generation; tri-generation; microturbines; fuel cells; renewable energy sources: solar, wind, hydro, biomass, wind turbines; photovoltaic; grid-connected power systems; stand-alone power systems.

ELEC5207
Advanced Power Conversion Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial - Laboratory 3 hrs/week; Project Work - own time 2 hrs/week. **Assumed knowledge:** ELEC3204 **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to cover advanced topics in power electronics and it applications. In particular, the power electronics interface design and implementation for microgrid, smart grids and modern power systems which have received tremendous attention in recent years. Many countries including Australia are developing different power electronics technologies such as integrating renewable energy sources into the grid, managing charging and discharging of high power energy storage system, controlling the reactive power of power electronics interfaces for grid stability, and adding communication capability to power electronics interfaces for smart meter implementation. The unit assumes prior fundamental knowledge of power electronics systems and applications, including the ability to analyse basic power converters for all four conversions (ac-ac, ac-dc, dc-ac, and ac-dc), and design and implement various applications, such as motor drive and battery charger, with the consideration of electrical characteristics of semiconductors and passive elements. This unit will cover advanced technologies on power electronics interfaces for smart grids and microgrid implementation, which include dynamic voltage restorer, active power filter, reactive power compensation, energy storage management, hybrid energy sources optimisation, multilevel inverter and control, D-STATCOM, etc. To analyse these advanced power conversion systems, some analytical techniques will be introduced. This includes resonant converters, soft-switching technique, ac equivalent circuit modeling, converter control and input/output filter design.

ELEC5208
Intelligent Electricity Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs/. **Assumed knowledge:** Fundamentals of Electricity Networks, Control Systems and Telecommunications **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to give students an introduction to the planning and operation of modern electricity grids, also known as "smart" grids. Traditional power networks featured a small number of large base-load plants sending power out over transmission lines to be distributed in radial lower voltage networks to loads. In response to the need to reduce carbon impact, future networks will feature diverse generation scattered all over the network including at distribution levels. Also there will be new loads such as electric vehicles and technologies including energy storage and lower voltage power flow control devices. The operation of these new networks will be possible by much greater use of information and communication technology (ICT) and control over the information networks.

The unit will cover recent relevant developments in energy technologies as well as important components of 'smart grids' such as supervisory control and data acquisition (SCADA), substation automation, remote terminal units (RTU), sensors and intelligent electronic devices (IED). Operation of these electricity grids requires a huge amount of data gathering, communication and information processing. The unit will discuss many emerging technologies for such data, information, knowledge and decision processes including communication protocols and network layouts, networking middleware and coordinated control. Information systems and data gathering will be used to assess key performance and security indicators associated with the operation of such grids including stability, reliability and power quality.

ELEC5211
Power Systems Dynamics and Control

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** ELEC3203 OR ELEC9203 OR ELEC5732 **Assumed knowledge:** The pre-required knowledge for learning this UoS is a deep understanding on circuit analysis and its applications in power system steady state analysis. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit deals with power systems modelling, analysis and simulation under dynamic conditions. The unit will cover the following topics:

- The links between power system steady state analysis and transient analysis

- Basics of dynamic system in general and stability analysis methods;

- Analysis of power systems subject to electromagnetic and electromechanical transients

- Power system modelling for stability analysis and electromagnetic transients analysis: Synchronous machine modelling using Park's transformation; Modelling of excitation systems and turbine governors; Modelling of the transmission system; Load modelling.

- Simulation of interconnected multi-machine systems

- Stability analysis: Transient stability; Small signal stability; Voltage stability;

- Power system control: Voltage control; Power system transient stability control; Power system dynamic stability control; Emergency control.

The unit is a specialist Unit for MPE (Power) and ME (Electrical and Power). It is also available as a recommended elective for BE Electrical (Power).

ELEC5212
Power Systems Planning and Markets

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/fortnight. **Prerequisites:** ELEC3203 OR ELEC9203 **Assumed knowledge:** The pre-required knowledge for learning this UoS is power system steady state analysis **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Deregulation of the electricity industry has fundamentally changed the power systems operation paradigm. The focus has shifted from central planning of vertically integrated utilities to market driven operation. Traditional electric energy producers and consumers play new roles in a power market environment and their behaviors are affected by the economic incentives to a large extent. Nevertheless, electric energy is a special commodity and cannot be traded as the other common goods. So a power market design has many special considerations compared with a conventional commercial market design. Knowledge of the power market mechanisms has become a necessary part in fully understanding the whole power system operations. To equip students with necessary skills to address the challenges of modern power systems, the unit will cover the following topics:

- Overview of the traditional electricity industry structure and operation: Economic dispatch, Power system operation states and respective reliability requirements.

- Drivers for the restructuring of the electricity industry.

- Electricity market design: Market structures (spot, bilateral, hybrid) ; Energy market; Ancillary services market; Key components in an electricity market;

- Electricity market participants and their roles in a market.

- Electricity economics: Power market from suppliers' view (Supply curve) and from demands' view (Demand curve); Market mechanism; Price and its elasticity; Cost and supply; Market power and monopoly.

- Cost of capital: Time value of money; Project evaluation methods from investments' point of view; Risk and return;

- Operation mechanisms of various designs of power markets;

- Power market practices around the world;

- Power system expansion planning: Fundamental knowledge of power system planning considerations, procedures and methods; Transmission planning; Generation planning; Power system adequacy assessment.

ELEC5212 is a specialist Unit for MPE (Power) and ME (Electrical and Power). It is also available as a recommended elective for BE Electrical (Power). This unit focuses on the power market principles and practices. Based on the knowledge of the power market operation, the power system planning procedures and methods will also be discussed.

ELEC5303
Computer Control System Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **Assessment:** Through semester assessment (44%) Final Exam (56%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5403
Radio Frequency Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorial 2 hrs/week; Lecture 2 hrs/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3305, ELEC3506, ELEC3607 and ELEC5508 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aim to teach the fundamentals concepts associated with:

oNetworked Embedded Systems, wireless sensor networks

oWireless channel propagation and radio power consumption

oWireless networks, ZigBee, Bluetooth, etc.

oSensor principle, data fusion, source detection and identification

oMultiple source detection, multiple access communications.

oNetwork topology, routing, network information theory

oDistributed source channel coding for sensor networks

oPower-aware and energy-aware communication protocols.

oDistributed embedded systems problems such as time synchronization and node localization,

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.

oAbility to identify the main issues and trade-offs in networked embedded systems.

oUnderstanding of the state-of-the-art solutions in the area

oBased on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.

oFamiliarization with a simulator platform and real hardware platforms for network embedded systems through the students involvement in project

ELEC5516
Electrical and Optical Sensor Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hours per week; Tutorial 1 hour per week; E-Learning 1 hour per week; Laboratory: 8 hours overall. **Assumed knowledge:** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The course focuses on environmentally friendly, intelligent sensors for multiple parameters monitoring to be used in power network and broadband network. The concepts learnt in this unit will be heavily used in various engineering applications in power systems, fiber optic systems and health monitoring. These concepts include:

-Theory, design and applications of optical fiber sensors.

-Sensor technologies for the growth of smart grid in power engineering.
-Actuators and motors for electrical sensor and its applications.

-Wearable sensor technologies for ehealth monitoring.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

ELEC5701
Technology Venture Creation

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Workgroup 1 hr/week. **Prohibitions:** ENGG5102 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

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.

This course is taught by instructors experienced in technology startups & venture capital. The course will include a number of guest lectures by industry.

ELEC5803
Advanced Bioelectronics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (ELEC2104 OR ELEC5720 OR ELEC9704) AND (ELEC2602 OR ELEC5722 OR ELEC9602) **Assumed knowledge:** A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit will cover advanced topics in the application of electronics and signal processing to physiological monitoring, biosensors, electrical stimulation and medical imaging. Electrical safety and regulations of medical devices in Australia will be introduced. Guest lectures will describe the different needs and requirements in several clinical areas including neonatal care, oncology, cardiology and neurology.

Assumed Knowledge: A strong foundation in control, signal processing and electronic devices and circuits is assumed including a knowledge of analogue and digital transistor operation, circuit building blocks such as the differential pair and current mirror, AC circuit analysis, Fourier analysis.

Management Elective units

Candidates must complete 12 credit points from the following Management Elective units of study.

ENGG5203
Quality Engineering and Management

Credit points: 6 **Session:** Semester 2 **Classes:** Presentation 2 hrs/week; Project Work - in class 2 hrs/week; Project Work - own time 6 hrs. **Assumed knowledge:** First degree in Engineering or a related discipline **Assessment:** Through semester assessment (100%) **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 control and management as well as systems assurance processes. 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.

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hrs/week; E-Learning 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.

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 expertis.

ENGG5214
Management of Technology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Uos is designed to develop competence in the management of technology. It will address all aspects of the management of technology, the nature and importance of technological change and innovation, within the context of the global knowledge economy, the management of the new product development process, the role of technology in manufacturing and service competitiveness, the role of IT in logistics management, supply chain strategies, and communication, and the characteristics of high technology markets.

ENGG5215
International Eng Strategy & Operations

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - in class 2 hr/week for half the semester. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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 1 hr/week; Tutorial 1 hr/week; Presentation 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units ELEC5020 and ELEC5022 (total 18 cp) in place of Capstone Project ELEC5021 and 6 cp of elective units.

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B covers the second of stage writing up and presenting the research results, and Capstone Project B extended allows the student to investigate a topic of greater depth and scope.

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.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units Research pathway students take Dissertation units ELEC5222 and ELEC5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

ELEC5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5222, ELEC8902, ENGG5223, ELEC8901 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that *they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*

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 sessions 1 & 2

ELEC5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ELEC8901, ELEC8902, ENGG5223, ENGG5222 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution.The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution.The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Fluids Engineering

Course overview

The Earth's biosphere is completely immersed in environmental fluids. Air and water are both considered fluids and therefore every living creature on the planet is affected by the behaviour and quality of these media.

A postgraduate specialisation in Fluids Engineering will teach you about fluid mechanics and engineering systems that are associated with the fluid environment.

Areas of study include wind engineering, reservoir stream and coastal engineering, advanced computational fluid dynamics and advanced water resources management.

This degree has been given provisional accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia.

Course requirements

Candidates for the Master of Professional Engineering (Fluids Engineering) complete 144 credit points as listed in the unit of study table.

Candidates also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Master of Professional Engineering (Fluids)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One			
Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
CIVL9110 **Materials**	6	**A** This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. **N** CIVL5501 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 1
CIVL9201 **Structural Mechanics**	6	**A** From Engineering Mechanics, 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. **N** CIVL5502 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 1
CIVL9810 **Engineering Construction and Surveying**	6	**N** CIVL5506 *This UoS includes a 2 day Engineering Construction and Survey Camp where field survey is practised and exercises in the application of field survey to Engineering Construction are also undertaken. The Camp is held 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)*	Semester 1
ENGG9802 **Engineering Mechanics**	6	**N** ENGG5802	Semester 2 Summer Main
Year One - Semester Two			
CIVL9230 **Structural Concepts and Design**	6	**A** Structural mechanics, first year mathematics, but these are not prerequisites **N** CIVL5509 *Basic structural elements include beams, columns slabs and simple frames*	Semester 2
CIVL9410 **Soil Mechanics**	6	**A** CIVL9201 OR CIVL5502. An understanding of simple statics, equilibrium, forces and bending moments, and of stress and strain and the relationship between them. This is covered by University of Sydney courses ENGG9802 Engineering Mechanics, CIVL9201 Structural Mechanics. Familiarity with the use of spreadsheets (Excel, Mathcad) to obtain solutions to engineering problems, and with the graphical presentation of this data. Familiarity with word processing packages for report presentation. Some of this is covered in the University of Sydney course ENGG9801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. **N** CIVL5504 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
CIVL9611 **Introductory Fluid Mechanics**	6	**A** CIVL5502 OR CIVL9201. 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 their analytical and numerical solutions **N** CIVL5505	Semester 2
GEOL1501 **Engineering Geology 1**	6	**A** No previous knowledge of Geology assumed **N** GEOS1903, GEOL1902, GEOS1003, GEOL1002	Semester 2
Year Two - Semester One			
CIVL9205 **Concrete Structures 1**	6	**A** (CIVL5501 OR CIVL9110) AND (CIVL5502 OR CIVL9201) AND (CIVL5509 OR CIVL9230). basic concepts of solid mechanics and structural mechanics, including: compatability of strains; stress-strain relationships; equilibrium; flexure, shear and torsion; statically determinate load effects (reactions, bending moments, shear forces); elastic beam theory (strains, stresses and beam deflections). **N** CIVL5507	Semester 1
CIVL9612 **Fluid Mechanics**	6	**A** (CIVL9201 OR CIVL5502) AND (CIVL9611 OR CIVL5505) AND (ENGG9802 OR ENGG5802). This unit of study follows on from Fluid Mechanics CIVL9611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. **N** CIVL5511	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL9811 **Engineering Design and 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. **N** CIVL5512 *This unit aims to prepare students for employment in a broad range of engineering areas including design, planning and construction management.*	Semester 1
ENGG5204 **Engineering Professional Practice**	6	**A** Competences and experience in engineering obtained during an accepted engineering degree	Semester 1
Year Two - Semester Two			
CHNG5005 **Wastewater Engineering**	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 1
CIVL9206 **Steel Structures 1**	6	**A** (CIVL9110 OR CIVL5501) AND (CIVL9201 OR CIVL5502) AND (CIVL9230 OR CIVL5509) AND (CIVL9235 OR CIVL5513) **N** CIVL5508 *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. A special "assumed knowledge" lecture will be given in Week 1 to refresh the knowledge of students.*	Semester 2
ENGG5205 **Professional Practice in PM**	6	*This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.*	Semester 1 Semester 2
Select 6 credit points from the Specialist electives block.			
Year Three - Semester One			
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5666 **Open Channel Flow & Hydraulic Structures**	6	**A** Advanced knowledge of fluid mechanics is necessary for this UoS.	Semester 1
CIVL5668 **Wind Engineering for Design-Fundamentals**	6		Semester 1
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5020 and 6cp of recommended electives with CIVL5222 Dissertation A.			
Select 6 credit points from the Specialist electives block.			
Year Three - Semester Two			
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5669 **Applied Fluid Engineering Computing**	6	**A** CIVL5511 or CIVL9612. 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
CIVL9903 **Civil Engineering Design**	6	**A** CIVL9410 AND CIVL9612 AND CIVL9811 **P** (CIVL9205 OR CIVL5507) AND (CIVL9206 OR CIVL5508) **N** CIVL5510	Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5021 and 6cp of recommended electives with CIVL5223 Dissertation B.			
Select 6 credit points from the Electives block.			
Specialist Elective units Candidates must complete 12 credit points from the following Specialist elective units of study.			
CIVL5351 **Geoenvironmental Engineering**	6		Semester 1
CIVL5665 **Advanced Water Resources Management**	6	**A** CIVL3612	Semester 2
CIVL5670 **Reservoir Stream & Coastal Eng**	6	**A** CIVL3612 and MATH2061.	Semester 1
Elective units Candidates must complete 6 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
CIVL5264 **Composite Steel-Concrete Structures**	6		Semester 2
CIVL5267 **Steel Structures - Advanced Design**	6		Semester 1
CIVL5268 **Structural Dynamics**	6	**A** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis.	Semester 2
CIVL5450 **Analysis and Design of Pile Foundations**	6		Semester 1
CIVL5451 **Computer Methods in Geotechnical Eng** *This unit of study is not available in 2015*	6		Semester 1
CIVL5453 **Geotechnical Hazards**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity).	Semester 2
CIVL5454 **Rock Engineering**	6	**A** Undergraduate geology and soil mechanics	Semester 2
CIVL5455 **Engineering Behaviour of Soils**	6	**A** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential.	Semester 2

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.

Extended Capstone Project candidates take Capstone Project units CIVL5020 and CIVL5022 (total 18 cp) in place of Capstone Project CIVL5021 and 6 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.

Research pathway candidates take Dissertation units CIVL5222 and CIVL5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5222 **Dissertation A**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
CIVL5223 **Dissertation B**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Fluids)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

CIVL9110
Materials

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 3 hours per week; Tutorial: 2 hours per week; Laboratory: 2 hours per semester. **Prohibitions:** CIVL5501 **Assumed knowledge:** This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. **Assessment:** Through semester assessment (60%), Final Exam (40%) **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.

CIVL9201
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:** CIVL5502 **Assumed knowledge:** From Engineering Mechanics, 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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

CIVL9810
Engineering Construction and 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. **Prohibitions:** CIVL5506 **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This UoS includes a 2 day Engineering Construction and Survey Camp where field survey is practised and exercises in the application of field survey to Engineering Construction are also undertaken. The Camp is held 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)

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.

ENGG9802
Engineering Mechanics

Credit points: 6 **Session:** Semester 2, Summer Main **Classes:** 2 hrs Lectures per week, 3hrs tutorial per week **Prohibitions:** ENGG5802 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to provide students with an understanding of and competence in solving statics and introductory dynamics 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. Introduction to kinematics and dynamics topics includes position, velocity and acceleration of a point; relative motion, force and acceleration, momentum, collisions and energy methods.

Year One - Semester Two

CIVL9230
Structural Concepts and Design

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** CIVL5509 **Assumed knowledge:** Structural mechanics, first year mathematics, but these are not prerequisites **Assessment:** Through semester assessment (25%), Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Basic structural elements include beams, columns slabs and simple frames

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.

CIVL9410
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:** CIVL5504 **Assumed knowledge:** CIVL9201 OR CIVL5502. An understanding of simple statics, equilibrium, forces and bending moments, and of stress and strain and the relationship between them. This is covered by University of Sydney courses ENGG9802 Engineering Mechanics, CIVL9201 Structural Mechanics. Familiarity with the use of spreadsheets (Excel, Mathcad) to obtain solutions to engineering problems, and with the graphical presentation of this data. Familiarity with word processing packages for report presentation. Some of this is covered in the University of Sydney course ENGG9801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

CIVL9611
Introductory Fluid Mechanics

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. 1 hour of laboratory work per semester. **Prohibitions:** CIVL5505 **Assumed knowledge:** CIVL5502 OR CIVL9201. 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 their analytical and numerical solutions **Assessment:** Through semester assessment (50%), Final Exam (50%) **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 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.

GEOL1501
Engineering Geology 1

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2 **Classes:** Two 2 hour lectures per week and 24 hours laboratory classes. **Prohibitions:** GEOS1903, GEOL1902, GEOS1003, GEOL1002 **Assumed knowledge:** No previous knowledge of Geology assumed **Assessment:** Practical laboratory work, Assignments, Tests and Quizzes, and a combined theory and practical exam (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Course objectives: To introduce basic geology and the principles of site investigation to civil engineering students. Expected outcomes: Students should develop an appreciation of geologic processes and their influence civil engineering works, acquire knowledge of the most important rocks and minerals and be able to identify them, and interpret geological maps with an emphasis on making construction decisions. Syllabus summary: Geological concepts relevant to civil engineering and the building environment. Introduction to minerals; igneous, sedimentary and metamorphic rocks, their occurrence, formation and significance. General introduction to physical geology and geomorphology, structural geology, plate tectonics, hydrogeology, rock core logging site investigation techniques for construction. Associated laboratory work on minerals, rocks and mapping.

Textbooks

Portrait of A Planet by Stephen Marshak, Published by H.H. Norton and Company and readings provided via Blackboard

Year Two - Semester One

CIVL9205
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. **Prohibitions:** CIVL5507 **Assumed knowledge:** (CIVL5501 OR CIVL9110) AND (CIVL5502 OR CIVL9201) AND (CIVL5509 OR CIVL9230). basic concepts of solid mechanics and structural mechanics, including: compatability of strains; stress-strain relationships; equilibrium; flexure, shear and torsion; statically determinate load effects (reactions, bending moments, shear forces); elastic beam theory (strains, stresses and beam deflections). **Assessment:** Through semester assessment (60%), Final Exam (40%) **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.

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.

CIVL9612
Fluid Mechanics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2hrs per week, Tutorial 2hrs per week, Laboratory 4.5 hrs per semester. **Prohibitions:** CIVL5511 **Assumed knowledge:** (CIVL9201 OR CIVL5502) AND (CIVL9611 OR CIVL5505) AND (ENGG9802 OR ENGG5802). This unit of study follows on from Fluid Mechanics CIVL9611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. **Assessment:** Through semester assessemnt (60%), Final Exam (40%) **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.

CIVL9811
Engineering Design and Construction

Credit points: 6 **Session:** Semester 1 **Classes:** Workshop 3 hours per week. Lecture/Presentation 2 hrs per week, **Prohibitions:** CIVL5512 **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. **Assessment:**

Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit aims to prepare students for employment in a broad range of engineering areas including design, planning and construction management.

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 CIVL9810 (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; timber engineeering; post-tensioned/prestressed concrete construction; civil engineering in a marine environment; insurance in the construction industry; occupational health and safety issues in the construction industry.

On day 1 of the course, a form based survey is taken to invite students to nominate specific areas of interest which may lead to adjustment in course content.

ENGG5204
Engineering Professional Practice

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Competences and experience in engineering obtained during an accepted engineering degree **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This UoS is designed to provide graduate engineers studying for a Master of Professional Engineering degree 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, basic knowledge of the law of contracts and legal responsibility, 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.

Year Two - Semester Two

CHNG5005
Wastewater Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Group assignment 2 hrs/week; Site Visit 5 hrs/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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to acquaint students with the application of chemical engineering concepts and practice in an environmental context, the important example of wastewater treatment will be explored.

The key issues that will be considered are: Wastewater creation and characterisation; Wastewater treatment costs; Primary, secondary and tertiary treatment options; High-rate anaerobic and aerobic treatment options; Sludge management and water recovery/reuse options; Process integration considerations.

By the end of this UOS, a student should have gained an engineering-based appreciation of the technical, economic and social challenges posed by wastewater generation and its cost-effective treatment.

This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught here are relevant to the real-world practice of chemical engineering across a broad range of industries.

CIVL9206
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. **Prohibitions:** CIVL5508 **Assumed knowledge:** (CIVL9110 OR CIVL5501) AND (CIVL9201 OR CIVL5502) AND (CIVL9230 OR CIVL5509) AND (CIVL9235 OR CIVL5513) **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: 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. A special "assumed knowledge" lecture will be given in Week 1 to refresh the knowledge of students.

Students should refer to the printed version of the unit outline distributed in lecture 1.

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.

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hrs/week; E-Learning 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.

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 expertis.

Select 6 credit points from the Specialist electives block.

Year Three - Semester One

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5666
Open Channel Flow & Hydraulic Structures

Credit points: 6 **Session:** Semester 1 **Assumed knowledge:** Advanced knowledge of fluid mechanics is necessary for this UoS. **Assessment:** Through semester assessment (100%) **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.

CIVL5668
Wind Engineering for Design-Fundamentals

Credit points: 6 **Session:** Semester 1 **Assessment:** Through semester assessment (60%) Final Exam (40%) **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, dynamic response of structures, and how all the above relates to AS1170.2.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5020 and 6cp of recommended electives with CIVL5222 Dissertation A.

Select 6 credit points from the Specialist electives block.

Year Three - Semester Two

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5669
Applied Fluid Engineering Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **Assumed knowledge:** CIVL5511 or CIVL9612. 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit is to provide students with advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving thermal fluid 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.

CIVL9903
Civil Engineering Design

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures and 3 hours of tutorials per week. **Prerequisites:** (CIVL9205 OR CIVL5507) AND (CIVL9206 OR CIVL5508) **Prohibitions:** CIVL5510 **Assumed knowledge:** CIVL9410 AND CIVL9612 AND CIVL9811 **Assessment:** Through semester assessment (75%), Final Exam (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5021 and 6cp of recommended electives with CIVL5223 Dissertation B.

Select 6 credit points from the Electives block.

Specialist Elective units

Candidates must complete 12 credit points from the following Specialist elective units of study.

CIVL5351
Geoenvironmental Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **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.

Learning Outcomes: 1. Analyse flow regime in soil using Darcy equation; 2. Analyse contaminant migration in soil using coupled flow and reactive diffusion advection equations; 3. Design a single or double composite landfill liner satisfying groundwater quality requirements; 4. Predict the potential for methane production in a landfill and assess the feasibility of waste-to-energy conversion; 5. Conduct research on a geoenvironmental topic as part for group.

Syllabus Summary: introduction to geoenvironmental engineering; integrated waste management and life cycle assessment; soil composition and mineralogy; types and characteristics of contaminants; theory of water seepage in soil and hydraulic conductivity; theory of reactive contaminant transport in soil including molecular diffusion, mechanical dispersion and advective flow; analytical and numerical solutions of reactive diffusion advection equation; design of landfills; geosynthetics and geomembranes; defects and leakage rates; methane generation in landfills and landfill gas management.

CIVL5665
Advanced Water Resources Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL3612 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit of study is to introduce students and professionals to water resources engineering. The aim of this unit is to provide an understanding of: hydrologic cycle from the broadest perspective, physical, chemical and biological characterization of water, how to change the water quality parameters, water quality control and management, water quality in the environment, nutrient and contaminant cycling and removal, water treatment methods for drinking, wastewater and groundwater, conservation/reuse/treatment techniques, desalination, stormwater, bioremediation and phytoremediation techniques. The topics mentioned above will be covered in both a qualitative and quantitative aspects. A basic level of integral and differential calculus is required as well as knowledge and use of calculation software such as Excell and Matlab.

CIVL5670
Reservoir Stream & Coastal Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs/week; Tutorials 2 hrs/week. **Assumed knowledge:** CIVL3612 and MATH2061. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

(Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)

Elective units

Candidates must complete 6 credit points from the following Advanced elective units of study.

CIVL5257
Concrete Structures: Prestressed

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - in class 1 hr/week; Project Work - own time 3 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

CIVL5264
Composite Steel-Concrete Structures

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students will understand the basic principles for the design of composite steel-concrete structures. In particular, they will develop an understanding of the procedures required for the design of composite beams, slabs and columns. Design guidelines will reflect requirements of the Australian Standards and international codes.

CIVL5267
Steel Structures - Advanced Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 as well as international standards, 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, AS/NZS4600, AISC-LRFD, BS5950 and GB50017 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.

CIVL5268
Structural Dynamics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis. **Assessment:** Through semester assessment (65%) Final Exam (35%) **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 (SDOF) 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 Parts4 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

* Ability to apply AS1170 Part 4 in structural design against earthquake actions

* Understanding of the fundamental concepts of earthquake engineering

CIVL5450
Analysis and Design of Pile Foundations

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week; Project Work - own time 6 hrs/week; Laboratory 3 hrs/week. **Assessment:** Through semester assessment (100%) **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.

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

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (100%) **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.

CIVL5453
Geotechnical Hazards

Credit points: 6 **Teacher/Coordinator:** Pierre Rognon **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 1 hour per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity). **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Geotechnical flows include landslides, rock falls and mud flows. They are triggered by soil failure due to natural or human causes. The objective of this Unit of Study is to develop the ability to assess and mitigate the risks associated to such events. Students will learn how to estimate when and where these events are likely to occur, how to define safety zones and how to design effective protection structures. The syllabus is comprised of (i) Landslide Risk Assessment and Management procedures (ii) post-faillure and out of equilibrium soil mechanics applied to prediction of rock fall, landslide and mud flow run-out distance and impact force on structures; (iii) design of geotechnical protection structures.

CIVL5454
Rock Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Laboratory 3 hrs/week. **Assumed knowledge:** Undergraduate geology and soil mechanics **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives: to develop an understanding of the behaviour and design of engineering structures in rock masses

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.

CIVL5455
Engineering Behaviour of Soils

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential. **Assessment:** Through semester assessment (100%) **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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units CIVL5020 and CIVL5022 (total 18 cp) in place of Capstone Project CIVL5021 and 6 cp of elective units.

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021).This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

Capstone Project 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 Capstone Project course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021) or this unit Capstone Project B extended (CIVL5022) worth 12 credit points. This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take

Dissertation units CIVL5222 and CIVL5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

CIVL5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

CIVL5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Geomechanical Engineering

Course overview

A postgraduate specialisation in Geomechanical Engineering will teach you about the engineering behaviour of earth materials.

You will learn how to examine the soil and rock layers that make up the Earth in order to determine their physical and chemical properties. It will equip you to design foundations and earthworks structures for buildings, roads, and many other types of projects.

Areas of study include environmental geotechnics, numerical methods of engineering, and rock engineering.

This degree has been given provisional accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia http://www.engineersaustralia.org.au/.

Course requirements

Candidates for the Master of Professional Engineering (Geomechanical Engineering) complete 144 credit points as listed in the unit of study table.

They also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Geomechanical)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One			
Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
CIVL9201 **Structural Mechanics**	6	**A** From Engineering Mechanics, 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. **N** CIVL5502 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 1
CIVL9810 **Engineering Construction and Surveying**	6	**N** CIVL5506 *This UoS includes a 2 day Engineering Construction and Survey Camp where field survey is practised and exercises in the application of field survey to Engineering Construction are also undertaken. The Camp is held 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)*	Semester 1
ENGG9802 **Engineering Mechanics**	6	**N** ENGG5802	Semester 2 Summer Main
Year One - Semester Two			
CIVL9230 **Structural Concepts and Design**	6	**A** Structural mechanics, first year mathematics, but these are not prerequisites **N** CIVL5509 *Basic structural elements include beams, columns slabs and simple frames*	Semester 2
CIVL9410 **Soil Mechanics**	6	**A** CIVL9201 OR CIVL5502. An understanding of simple statics, equilibrium, forces and bending moments, and of stress and strain and the relationship between them. This is covered by University of Sydney courses ENGG9802 Engineering Mechanics, CIVL9201 Structural Mechanics. Familiarity with the use of spreadsheets (Excel, Mathcad) to obtain solutions to engineering problems, and with the graphical presentation of this data. Familiarity with word processing packages for report presentation. Some of this is covered in the University of Sydney course ENGG9801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. **N** CIVL5504 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
CIVL9611 **Introductory Fluid Mechanics**	6	**A** CIVL5502 OR CIVL9201. 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 their analytical and numerical solutions **N** CIVL5505	Semester 2
GEOL1501 **Engineering Geology 1**	6	**A** No previous knowledge of Geology assumed **N** GEOS1903, GEOL1902, GEOS1003, GEOL1002	Semester 2
Year Two - Semester One			
CIVL9205 **Concrete Structures 1**	6	**A** (CIVL5501 OR CIVL9110) AND (CIVL5502 OR CIVL9201) AND (CIVL5509 OR CIVL9230). basic concepts of solid mechanics and structural mechanics, including: compatability of strains; stress-strain relationships; equilibrium; flexure, shear and torsion; statically determinate load effects (reactions, bending moments, shear forces); elastic beam theory (strains, stresses and beam deflections). **N** CIVL5507	Semester 1
CIVL9612 **Fluid Mechanics**	6	**A** (CIVL9201 OR CIVL5502) AND (CIVL9611 OR CIVL5505) AND (ENGG9802 OR ENGG5802). This unit of study follows on from Fluid Mechanics CIVL9611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. **N** CIVL5511	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL9811 **Engineering Design and 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. **N** CIVL5512 *This unit aims to prepare students for employment in a broad range of engineering areas including design, planning and construction management.*	Semester 1
ENGG5204 **Engineering Professional Practice**	6	**A** Competences and experience in engineering obtained during an accepted engineering degree	Semester 1
Year Two - Semester Two			
CIVL5455 **Engineering Behaviour of Soils**	6	**A** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential.	Semester 2
CIVL5508 **Foundations of Steel Structures 1** *This unit of study is not available in 2015*	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Introduction to Structural Concepts and Design as well as knowledge of the content in 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.	Semester 2
ENGG5205 **Professional Practice in PM**	6	*This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.*	Semester 1 Semester 2
Select 6 credit points from the Specialist electives block.			
Year Three - Semester One			
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5450 **Analysis and Design of Pile Foundations**	6		Semester 1
CIVL5458 **Numerical Methods in Civil Engineering**	6		Semester 1
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5020 and 6cp of recommended electives with CIVL5222 Dissertation A.			
Select 6 credit points from the Specialist electives block.			
Year Three - Semester Two			
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5454 **Rock Engineering**	6	**A** Undergraduate geology and soil mechanics	Semester 2
CIVL9903 **Civil Engineering Design**	6	**A** CIVL9410 AND CIVL9612 AND CIVL9811 **P** (CIVL9205 OR CIVL5507) AND (CIVL9206 OR CIVL5508) **N** CIVL5510	Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5021 and 6cp of recommended electives with CIVL5223 Dissertation B.			
Select 6 credit points from the Electives block.			
Specialist Elective units Candidates must complete the following Specialist elective units of study.			
CIVL5351 **Geoenvironmental Engineering**	6		Semester 1
CIVL5453 **Geotechnical Hazards**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity).	Semester 2
Elective units Candidates must complete 6 credit points from the following Elective units of study.			
CHNG5005 **Wastewater Engineering**	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 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
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	**A** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis.	Semester 2
CIVL5666 **Open Channel Flow & Hydraulic Structures**	6	**A** Advanced knowledge of fluid mechanics is necessary for this UoS.	Semester 1
CIVL5668 **Wind Engineering for Design-Fundamentals**	6		Semester 1
CIVL5669 **Applied Fluid Engineering Computing**	6	**A** CIVL5511 or CIVL9612. 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

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.

Extended Capstone Project candidates take Capstone Project units CIVL5020 and CIVL5022 (total 18 cp) in place of Capstone Project CIVL5021 and 6 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.

Research pathway candidates take Dissertation units CIVL5222 and CIVL5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5222 **Dissertation A**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
CIVL5223 **Dissertation B**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Geomechanical)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

CIVL9201
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:** CIVL5502 **Assumed knowledge:** From Engineering Mechanics, 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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

CIVL9810
Engineering Construction and 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. **Prohibitions:** CIVL5506 **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This UoS includes a 2 day Engineering Construction and Survey Camp where field survey is practised and exercises in the application of field survey to Engineering Construction are also undertaken. The Camp is held 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)

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.

ENGG9802
Engineering Mechanics

Credit points: 6 **Session:** Semester 2, Summer Main **Classes:** 2 hrs Lectures per week, 3hrs tutorial per week **Prohibitions:** ENGG5802 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to provide students with an understanding of and competence in solving statics and introductory dynamics 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. Introduction to kinematics and dynamics topics includes position, velocity and acceleration of a point; relative motion, force and acceleration, momentum, collisions and energy methods.

Year One - Semester Two

CIVL9230
Structural Concepts and Design

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** CIVL5509 **Assumed knowledge:** Structural mechanics, first year mathematics, but these are not prerequisites **Assessment:** Through semester assessment (25%), Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Basic structural elements include beams, columns slabs and simple frames

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.

CIVL9410
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:** CIVL5504 **Assumed knowledge:** CIVL9201 OR CIVL5502. An understanding of simple statics, equilibrium, forces and bending moments, and of stress and strain and the relationship between them. This is covered by University of Sydney courses ENGG9802 Engineering Mechanics, CIVL9201 Structural Mechanics. Familiarity with the use of spreadsheets (Excel, Mathcad) to obtain solutions to engineering problems, and with the graphical presentation of this data. Familiarity with word processing packages for report presentation. Some of this is covered in the University of Sydney course ENGG9801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

CIVL9611
Introductory Fluid Mechanics

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. 1 hour of laboratory work per semester. **Prohibitions:** CIVL5505 **Assumed knowledge:** CIVL5502 OR CIVL9201. 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 their analytical and numerical solutions **Assessment:** Through semester assessment (50%), Final Exam (50%) **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 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.

GEOL1501
Engineering Geology 1

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2 **Classes:** Two 2 hour lectures per week and 24 hours laboratory classes. **Prohibitions:** GEOS1903, GEOL1902, GEOS1003, GEOL1002 **Assumed knowledge:** No previous knowledge of Geology assumed **Assessment:** Practical laboratory work, Assignments, Tests and Quizzes, and a combined theory and practical exam (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Course objectives: To introduce basic geology and the principles of site investigation to civil engineering students. Expected outcomes: Students should develop an appreciation of geologic processes and their influence civil engineering works, acquire knowledge of the most important rocks and minerals and be able to identify them, and interpret geological maps with an emphasis on making construction decisions. Syllabus summary: Geological concepts relevant to civil engineering and the building environment. Introduction to minerals; igneous, sedimentary and metamorphic rocks, their occurrence, formation and significance. General introduction to physical geology and geomorphology, structural geology, plate tectonics, hydrogeology, rock core logging site investigation techniques for construction. Associated laboratory work on minerals, rocks and mapping.

Textbooks

Portrait of A Planet by Stephen Marshak, Published by H.H. Norton and Company and readings provided via Blackboard

Year Two - Semester One

CIVL9205
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. **Prohibitions:** CIVL5507 **Assumed knowledge:** (CIVL5501 OR CIVL9110) AND (CIVL5502 OR CIVL9201) AND (CIVL5509 OR CIVL9230). basic concepts of solid mechanics and structural mechanics, including: compatability of strains; stress-strain relationships; equilibrium; flexure, shear and torsion; statically determinate load effects (reactions, bending moments, shear forces); elastic beam theory (strains, stresses and beam deflections). **Assessment:** Through semester assessment (60%), Final Exam (40%) **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.

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.

CIVL9612
Fluid Mechanics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2hrs per week, Tutorial 2hrs per week, Laboratory 4.5 hrs per semester. **Prohibitions:** CIVL5511 **Assumed knowledge:** (CIVL9201 OR CIVL5502) AND (CIVL9611 OR CIVL5505) AND (ENGG9802 OR ENGG5802). This unit of study follows on from Fluid Mechanics CIVL9611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. **Assessment:** Through semester assessemnt (60%), Final Exam (40%) **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.

CIVL9811
Engineering Design and Construction

Credit points: 6 **Session:** Semester 1 **Classes:** Workshop 3 hours per week. Lecture/Presentation 2 hrs per week, **Prohibitions:** CIVL5512 **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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit aims to prepare students for employment in a broad range of engineering areas including design, planning and construction management.

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 CIVL9810 (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; timber engineeering; post-tensioned/prestressed concrete construction; civil engineering in a marine environment; insurance in the construction industry; occupational health and safety issues in the construction industry.

On day 1 of the course, a form based survey is taken to invite students to nominate specific areas of interest which may lead to adjustment in course content.

ENGG5204
Engineering Professional Practice

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Competences and experience in engineering obtained during an accepted engineering degree **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This UoS is designed to provide graduate engineers studying for a Master of Professional Engineering degree 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, basic knowledge of the law of contracts and legal responsibility, 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.

Year Two - Semester Two

CIVL5455
Engineering Behaviour of Soils

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential. **Assessment:** Through semester assessment (100%) **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.

CIVL5508
Foundations of Steel Structures 1

This unit of study is not available in 2015

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 Structural Mechanics, Introduction to Structural Concepts and Design as well as knowledge of the content in 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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hrs/week; E-Learning 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.

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 expertis.

Select 6 credit points from the Specialist electives block.

Year Three - Semester One

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5450
Analysis and Design of Pile Foundations

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week; Project Work - own time 6 hrs/week; Laboratory 3 hrs/week. **Assessment:** Through semester assessment (100%) **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.

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.

CIVL5458
Numerical Methods in Civil Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives:

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.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5020 and 6cp of recommended electives with CIVL5222 Dissertation A.

Select 6 credit points from the Specialist electives block.

Year Three - Semester Two

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5454
Rock Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Laboratory 3 hrs/week. **Assumed knowledge:** Undergraduate geology and soil mechanics **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives: to develop an understanding of the behaviour and design of engineering structures in rock masses

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.

CIVL9903
Civil Engineering Design

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures and 3 hours of tutorials per week. **Prerequisites:** (CIVL9205 OR CIVL5507) AND (CIVL9206 OR CIVL5508) **Prohibitions:** CIVL5510 **Assumed knowledge:** CIVL9410 AND CIVL9612 AND CIVL9811 **Assessment:** Through semester assessment (75%), Final Exam (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5021 and 6cp of recommended electives with CIVL5223 Dissertation B.

Select 6 credit points from the Electives block.

Specialist Elective units

Candidates must complete the following Specialist elective units of study.

CIVL5351
Geoenvironmental Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **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.

Learning Outcomes: 1. Analyse flow regime in soil using Darcy equation; 2. Analyse contaminant migration in soil using coupled flow and reactive diffusion advection equations; 3. Design a single or double composite landfill liner satisfying groundwater quality requirements; 4. Predict the potential for methane production in a landfill and assess the feasibility of waste-to-energy conversion; 5. Conduct research on a geoenvironmental topic as part for group.

Syllabus Summary: introduction to geoenvironmental engineering; integrated waste management and life cycle assessment; soil composition and mineralogy; types and characteristics of contaminants; theory of water seepage in soil and hydraulic conductivity; theory of reactive contaminant transport in soil including molecular diffusion, mechanical dispersion and advective flow; analytical and numerical solutions of reactive diffusion advection equation; design of landfills; geosynthetics and geomembranes; defects and leakage rates; methane generation in landfills and landfill gas management.

CIVL5453
Geotechnical Hazards

Credit points: 6 **Teacher/Coordinator:** Pierre Rognon **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 1 hour per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity). **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Geotechnical flows include landslides, rock falls and mud flows. They are triggered by soil failure due to natural or human causes. The objective of this Unit of Study is to develop the ability to assess and mitigate the risks associated to such events. Students will learn how to estimate when and where these events are likely to occur, how to define safety zones and how to design effective protection structures. The syllabus is comprised of (i) Landslide Risk Assessment and Management procedures (ii) post-faillure and out of equilibrium soil mechanics applied to prediction of rock fall, landslide and mud flow run-out distance and impact force on structures; (iii) design of geotechnical protection structures.

Elective units

Candidates must complete 6 credit points from the following Elective units of study.

CHNG5005
Wastewater Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Group assignment 2 hrs/week; Site Visit 5 hrs/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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to acquaint students with the application of chemical engineering concepts and practice in an environmental context, the important example of wastewater treatment will be explored.

The key issues that will be considered are: Wastewater creation and characterisation; Wastewater treatment costs; Primary, secondary and tertiary treatment options; High-rate anaerobic and aerobic treatment options; Sludge management and water recovery/reuse options; Process integration considerations.

By the end of this UOS, a student should have gained an engineering-based appreciation of the technical, economic and social challenges posed by wastewater generation and its cost-effective treatment.

This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught here are relevant to the real-world practice of chemical engineering across a broad range of industries.

CIVL5257
Concrete Structures: Prestressed

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - in class 1 hr/week; Project Work - own time 3 hrs/week. **Assessment:**

Through semester assessment (60%) Final Exam (40%) **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.

CIVL5264
Composite Steel-Concrete Structures

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students will understand the basic principles for the design of composite steel-concrete structures. In particular, they will develop an understanding of the procedures required for the design of composite beams, slabs and columns. Design guidelines will reflect requirements of the Australian Standards and international codes.

CIVL5267
Steel Structures - Advanced Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 as well as international standards, 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, AS/NZS4600, AISC-LRFD, BS5950 and GB50017 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.

CIVL5268
Structural Dynamics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis. **Assessment:** Through semester assessment (65%) Final Exam (35%) **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 (SDOF) 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 Parts4 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

* Ability to apply AS1170 Part 4 in structural design against earthquake actions

* Understanding of the fundamental concepts of earthquake engineering

CIVL5666
Open Channel Flow & Hydraulic Structures

Credit points: 6 **Session:** Semester 1 **Assumed knowledge:** Advanced knowledge of fluid mechanics is necessary for this UoS. **Assessment:** Through semester assessment (100%) **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.

CIVL5668
Wind Engineering for Design-Fundamentals

Credit points: 6 **Session:** Semester 1 **Assessment:** Through semester assessment (60%) Final Exam (40%) **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, dynamic response of structures, and how all the above relates to AS1170.2.

CIVL5669
Applied Fluid Engineering Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **Assumed knowledge:** CIVL5511 or CIVL9612. 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit is to provide students with advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving thermal fluid 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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units CIVL5020 and CIVL5022 (total 18 cp) in place of Capstone Project CIVL5021 and 6 cp of elective units.

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

Capstone Project 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 Capstone Project course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021) or this unit Capstone Project B extended (CIVL5022) worth 12 credit points. This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units CIVL5222 and CIVL5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

CIVL5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

CIVL5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Mechanical Engineering

Course overview

A postgraduate specialisation in Mechanical Engineering will provide you with an advanced understanding of the design of mechanical components, whole machines, mechanical systems and mechanical processes.

You will learn how to analyse mechanical design, using the principles of motion, energy, and force to ensure the safety and reliability of products, and you will understand how efficient systems and processes support the manufacture of products at a competitive cost.

Areas of study include advanced computational fluid analysis, experimental robotics, advanced combustion and computational nanotechnology.

This degree has been given full accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia.

Course requirements

Candidates for the Master of Professional Engineering (Mechanical Engineering) complete 144 credit points as listed in the unit of study table.

They also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Mechanical)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One			
Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
AMME9261 **Fluid Mechanics 1**	6	**A** Students are expected to be familiar with first year basic maths: integral calculus, differential calculus and linear algebra. **N** AMME5200	Semester 1
AMME9500 **Engineering Dynamics**	6	**A** Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **N** AMME5500	Semester 1
AMME9700 **Instrumentation**	6	**A** Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. **N** AMME5700	Semester 1
ENGG9801 **Engineering Computing**	6	**N** ENGG5801	Semester 1
Year One - Semester Two			
AMME9262 **Thermal Engineering 1**	6	**A** Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra. **N** AMME9200 OR AMME5200.	Semester 2
AMME9301 **Mechanics of Solids 1**	6	**A** Physics, statics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **N** AMME5301	Semester 2
AMME9302 **Materials 1**	6	**N** : AMME5302 OR CIVL5501	Semester 1 Semester 2
MECH5400 **Foundations of Mechanical Design 1** *This unit of study is not available in 2015*	6	**A** Knowledge of programming in MATLAB and a knowledge of Engineering Mechanics (statics) **N** MECH2400	Semester 2
Year Two - Semester One			
AMME9501 **System Dynamics and Control**	6	**A** AMME5500 OR AMME9500 **N** AMME5501	Semester 1
MECH9261 **Fluid Mechanics 2**	6	**A** AMME9200. Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **N** MECH5261	Semester 1
MECH9362 **Materials 2**	6	**A** Mechanics of solids: statics, stress, strain **P** AMME9302 OR AMME5302 **N** MECH5362	Semester 1
MECH9660 **Manufacturing Engineering**	6	**P** MECH9400 or MECH5400 or MECH2400 **N** MECH5660	Semester 1
Year Two - Semester Two			
MECH9260 **Thermal Engineering 2**	6	**A** Fundamentals of thermodynamics are needed to begin this more advanced course. **P** AMME9200 OR AMME5200 **N** MECH5262	Semester 2
MECH9361 **Mechanics of Solids 2**	6	**A** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **P** AMME9301 OR AMME5301 **N** MECH5361	Semester 2
Select 12 credit points from Mechanical recommended electives block.			
Year Three - Semester One			
AMME5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study).	Semester 1 Semester 2
AMME9601 **Professional Engineering**	6	**A** Experience in a professional engineering related field is desirable to aid in group tutorial discussion. **N** AMME5601	Semester 1
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5020 and 6cp of recommended electives with AMME5222 Dissertation A.			
Select 12 credit points from Mechanical recommended electives block.			
Year Three - Semester Two			
AMME5021 **Capstone Project B**	6	**C** AMME5020	Semester 1 Semester 2
ENGG5103 **Safety Systems and Risk Analysis**	6		Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5021 and 6cp of recommended electives with AMME5223 Dissertation B.			
Select 12 credit points from Mechanical recommended electives block.			
Elective units Candidates must complete 36 credit points from the following Mechanical elective units of study.			
Thermofluids			
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field. *Note: Department permission required for enrolment* *Department Permission required for Enrolment*	Semester 2
AMME5101 **Energy and the Environment**	6	**P** 24 credits of 3000-level or above units of study	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** The students will require 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. *Note: Department permission required for enrolment*	Semester 2
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
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. **P** MECH3260 **N** MECH4255	Semester 2
MECH5265 **Advanced Combustion**	6	**A** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **P** (MECH3260 AND MECH3261) OR MECH5262 OR MECH9260	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. **P** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) *Note: Department permission required for enrolment*	Semester 2
Materials			
AERO9301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field. **P** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **N** AERO5301	Semester 1
AMME5271 **Computational Nanotechnology**	6	**A** The students will require 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. *Note: Department permission required for enrolment*	Semester 2
AMME9961 **Biomechanics and Biomaterials**	6	**A** Chemistry, Biology, Materials Engineering, and Engineering Design at least at the Junior level. **N** AMME5961	Semester 2
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
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 *Note: Department permission required for enrolment* *Students will attend a series lectures on failure analyses of engineering materials addressing brittle rupture/fracture, yielding, cleavage fracture, fatigue and creep failure of engineering materials under static and dynamic loads. Students will also attend short introduction courses on optical microscopy and scanning electron microscopy (SEM) to gain some essential knowledge in diagnostic and forensic analyses of materials failure. Each student participates in a couple of group projects relevant to diagnostic analyses of failure of typical engineering materials such as steel, aluminium, magnesium alloys, engineering plastics and advanced fibre composites. Under the guidance of the supervisor, the student will learn how to initiate a proposal on failure analysis, how to do the project investigation and how to prepare and carry out technical communications (oral presentation and discussion between groups). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.*	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 *The UoS covers the key knowledge of most smart materials such as dielectric, piezoelectric, magneto-electric and shape memory materials. Each student participates in a couple of group projects relevant to characterization of structure-property relationship of functional structures with desired performance. Under the guidance of the supervisor, the student will learn how to develop a proposal, how to do the project investigation and how to prepare and carry out the technical communications (writing and oral). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.*	Semester 2
MECH5310 **Advanced Engineering Materials**	6	**N** MECH4310 *Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.*	Semester 1
MECH5416 **Advanced Design and Analysis**	6	**A** 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	Semester 1
Design and Manufacturing			
AERO5010 **Optimisation Methods in Engineering**	6	**A** BE in the area of Aerospace or related Engineering field. *Note: Department permission required for enrolment* *Department Permission required for Enrolment*	Semester 2
AERO9301 **Applied Finite Element Analysis**	6	**A** BE in area of Aerospace Engineering or related Engineering field. **P** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **N** AERO5301	Semester 1
AMME5310 **Engineering Tribology**	6	**A** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261)	Semester 1
AMME5510 **Vibration and Acoustics**	6	**A** (AMME2301 OR AMME9301) AND AMME2200 AND (AMME2500 OR AMME9500) *Note: Department permission required for enrolment*	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. *Note: Department permission required for enrolment*	Semester 2
AMME5902 **Advanced Computer Aided Manufacturing**	6		Semester 2
AMME5912 **Crash Analysis and Design**	6	**A** Computer Aided Drafting, Basic FEA principles and Solid Mechanics	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
MECH5416 **Advanced Design and Analysis**	6	**A** 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	Semester 1
Mechatronics			
AERO9760 **Spacecraft and Satellite Design**	6	**N** AERO5760	Semester 2
AMME5520 **Advanced Control and Optimisation**	6	**A** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **P** AMME3500 OR AMME5501 OR AMME9501	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. *Note: Department permission required for enrolment*	Semester 2
AMME5902 **Advanced Computer Aided Manufacturing**	6		Semester 2
AMME5951 **Fundamentals of Neuromodulation**	6	**A** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent.	Semester 1

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 understanding of basic principles of chemistry, physics and mechanics	Semester 1
MECH5416 **Advanced Design and Analysis**	6	**A** 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	Semester 1
MECH5720 **Sensors and Signals**	6	**A** Strong MATLAB skills **N** MECH4720	Semester 2
MTRX5700 **Experimental Robotics**	6	**A** Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed. **P** (AMME3500 OR AMME9501) AND MTRX3700	Semester 1

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.

Extended Capstone Project candidates take Capstone Project units AMME5020 and AMME5022 (total 18 cp) in place of Capstone Project AMME5021 and 6 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study).	Semester 1 Semester 2
AMME5021 **Capstone Project B**	6	**C** AMME5020	Semester 1 Semester 2
AMME5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.

Research pathway candidates take Dissertation units AMME5222 and AMME5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
AMME5222 **Dissertation A**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2
AMME5223 **Dissertation B**	12	*Note: Department permission required for enrolment* *In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.*	Semester 1 Semester 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Mechanical)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

AMME9261
Fluid Mechanics 1

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 3 hours per week; Tutorial: 2 hours per week; Laboratory: 6 hours overall. **Prohibitions:** AMME5200 **Assumed knowledge:** Students are expected to be familiar with first year basic maths: integral calculus, differential calculus and linear algebra. **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers the fundamentals of fluid statics and fluid dynamics. At the end of this unit students will have: an understanding of the basic equations governing the statics and dynamics of fluids; the ability to analyze and determine the forces applied by a 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 basic concepts of viscosity, density, continuum, pressure, force, buoyancy, acceleration, continuity, conservation of momentum, streamlines, Bernoulli equation, Euler equation, Navier-Stokes equation. Experiments will introduce flow measuring devices and flow observation.

AMME9500
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. **Prohibitions:** AMME5500 **Assumed knowledge:** Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

AMME9700
Instrumentation

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hrs of lectures per week, 1hr of tutorials per week, 6 hrs of laboratory work per semester. **Prohibitions:** AMME5700 **Assumed knowledge:** Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to develop in students an understanding of the engineering measurements and instrumentation systems. The students will acquire an ability to make accurate and meaningful measurements. It will cover the general areas of electrical circuits and mechanical/electronic instrumentation for strain, force, pressure, moment, torque, displacement, velocity, acceleration, temperature and so on.

ENGG9801
Engineering Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week **Prohibitions:** ENGG5801 **Assessment:** Through semester assessment (50%), Final Exam (50%) **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. There will be a major project which uses programming to solve a real world engineering problem. 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.

Year One - Semester Two

AMME9262
Thermal Engineering 1

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 2 hours per week; Laboratory: 12 hours overall. **Prohibitions:** AMME9200 OR AMME5200. **Assumed knowledge:** Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra. **Assessment:** Through semester assessment (50%), Final Exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to teach the basic laws of thermodynamics and heat transfer. At the end of this unit students will have: an understanding of the basic laws of thermodynamics and heat transfer; The ability to analyze the thermodynamics of a simple open or closed engineering system. The basic knowledge to analyse and design 1D thermal circuits. 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, heat transfer by conduction,

convection and radiation, 1D thermal circuits and transient heat transfer.

AMME9301
Mechanics of Solids 1

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 3 hours per week; Tutorials: 2 hours per week **Prohibitions:** AMME5301 **Assumed knowledge:** Physics, statics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. **Assessment:** Through semester assessment (35%), Final Exam (65%) **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.

AMME9302
Materials 1

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lectures : 3 hours per week; Tutorials : 2 hours per week; Laboratory: one 3 hour session. **Prohibitions:** : AMME5302 OR CIVL5501 **Assessment:** Through semester assessment (46%), Final Exam (54%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit 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.

MECH5400
Foundations of Mechanical Design 1

This unit of study is not available in 2015

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:** Knowledge of programming in MATLAB and a knowledge of Engineering Mechanics (statics) **Assessment:** Through semester assessment (100%) **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. the efficient use of a CAD package
3. creativity,
4. the design process,
5. methods used to analyse designs.
6. Standard components

Year Two - Semester One

AMME9501
System Dynamics and Control

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures : 2 hours per week; Tutorials : 3 hours per week **Prohibitions:** AMME5501 **Assumed knowledge:** AMME5500 OR AMME9500 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

MECH9261
Fluid Mechanics 2

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; Project Work - in class: 3 hours per week **Prohibitions:** MECH5261 **Assumed knowledge:** AMME9200. Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **Assessment:** Through semester assessment(60%), Final Exam (40%) **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 dimensionless analysis, Bernoulli equation, pipe flow, frictional losses, laminar and turbulent boundary layers, open channel flow and hydraulic jump, lift and drag, compressible flow and shock waves, turbomachinery .

MECH9362
Materials 2

Credit points: 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** AMME9302 OR AMME5302 **Prohibitions:** MECH5362 **Assumed knowledge:** Mechanics of solids: statics, stress, strain **Assessment:** Through semester assessment (45%), Final Exam (55%) **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.

MECH9660
Manufacturing Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. **Prerequisites:** MECH9400 or MECH5400 or MECH2400 **Prohibitions:** MECH5660 **Assessment:** Through semester assessment (100%) **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); merits and limitations; CNC and CAM;

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

Year Two - Semester Two

MECH9260
Thermal Engineering 2

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 2 hours per week; Laboratory: 6 hours overall; **Prerequisites:** AMME9200 OR AMME5200 **Prohibitions:** MECH5262 **Assumed knowledge:** Fundamentals of thermodynamics are needed to begin this more advanced course. **Assessment:** Through semester assessment(60%), Final Exam (40%) **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 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. Students will have the ability to solve realistic complex engineering problems using computational methods.

Course content will include: Thermodynamics: exergy and entropy, power cycles: spark ignition, Diesel, gas turbine; gas mixtures, humidity, psychrometry, air-conditioning, combustion: stoichiometry, gas analysis, combustion, thermochemistry, adiabatic flame temperature, 2nd Law analysis of reacting systems, 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, environmental radiation, solar.

MECH9361
Mechanics of Solids 2

Credit points: 6 **Session:** Semester 2 **Classes:** Tutorial: 2 hours per week; Lecture: 3 hours per week; Laboratory: 1 hours per week **Prerequisites:** AMME9301 OR AMME5301 **Prohibitions:** MECH5361 **Assumed knowledge:** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series **Assessment:** Through semester assessment(70%), Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The UoS aims to: teach the fundamentals of analysing stress and deformation in a solid under complex loading associated with the elemental structures/components in aerospace, mechanical and biomedical engineering; develop the following attributes: understand the fundamental principles of solid mechanics and basic methods for stress and deformation analysis of a solid structure/element in the above mentioned engineering areas; gain the ability to analyse problems in terms of strength and deformation in relation to the design, manufacturing and maintenance of machines, structures, devices and elements in the above mentioned engineering areas.

At the end of this unit students will have a good understanding of the following: applicability of the theories and why so; how and why to do stress analysis; why we need equations of motion/equilibrium; how and why to do strain analysis; why we need compatibility equations; why Hooke`s law, why plasticity and how to do elastic and plastic analysis; how and why to do mechanics modelling; how to describe boundary conditions for complex engineering problems; why and how to solve a mechanics model based on a practical problem; why and how to use energy methods for stress and deformation analysis; why and how to do stress concentration analysis and its relation to fracture and service life of a component/structure; how and why to do fundamental plastic deformation analysis; how and why the finite element method is introduced and used for stress and deformation analysis.

The students are expected to develop the ability of solving engineering problems by comprehensively using the skills attained above. The students will get familiar with finite element analysis as a research and analysis tool for various real-life problems.

Select 12 credit points from Mechanical recommended electives block.

Year Three - Semester One

AMME5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME9601
Professional Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures 2 hrs per week and tutorials 2 hrs per week **Prohibitions:** AMME5601 **Assumed knowledge:** Experience in a professional engineering related field is desirable to aid in group tutorial discussion. **Assessment:** Through semester assessment (100%) **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). 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.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5020 and 6cp of recommended electives with AMME5222 Dissertation A.

Select 12 credit points from Mechanical recommended electives block.

Year Three - Semester Two

AMME5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Corequisites:** AMME5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

ENGG5103
Safety Systems and Risk Analysis

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 4801:2001 & 4804:2001 form the foundation for teaching methods of developing, implementing, monitoring and improving a safety management system in an Engineering context.

Students will be exposed to a number of case studies related to safety systems and on completion of the course be able to develop a safety management plan for an Engineering facility that meets the requirements of NSW legislation and Australian standards for Occupational Health and Safety management systems.

Students are introduced to a variety of risk management approaches used by industry, and methods to quantify and estimate the consequences and probabilities of risks occurring, as applied to realistic industrial scenarios.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research pathway and may replace AMME5021 and 6cp of recommended electives with AMME5223 Dissertation B.

Select 12 credit points from Mechanical recommended electives block.

Elective units

Candidates must complete 36 credit points from the following Mechanical elective units of study.

Thermofluids

AERO5010
Optimisation Methods in Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time 10 hrs/week. **Assumed knowledge:** BE in the area of Aerospace or related Engineering field. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Department Permission required for Enrolment

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.

Note: Department Permission required for enrolment

AMME5101
Energy and the Environment

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - own time 2 hrs/week. **Prerequisites:** 24 credits of 3000-level or above units of study **Assessment:** Through semester assessment (100%) **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.

AMME5202
Advanced Computational Fluid Dynamics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 2 hrs/week; Lecture 1 hr/week; Tutorial 1 hr/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. **Assessment:** Through semester assessment (100%) **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/diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 3 hrs/week. **Assumed knowledge:** The students will require 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics

Assessment: Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

MECH5255
Air Conditioning and Refrigeration (Adv)

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prerequisites:** MECH3260 **Prohibitions:** MECH4255 **Assumed knowledge:** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

MECH5265
Advanced Combustion

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prerequisites:** (MECH3260 AND MECH3261) OR MECH5262 OR MECH9260 **Assumed knowledge:** Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

MECH5275
Advanced Renewable Energy

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Prerequisites:** (MECH3260 AND MECH3261) OR (AERO3260 AND AERO3261) OR (MECH5262 AND MECH5261) OR (MECH9260 AND MECH9261) **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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

Materials

AERO9301
Applied Finite Element Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** 2.5 hours of lectures and 2 hours of workgroup session per week **Prerequisites:** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **Prohibitions:** AERO5301 **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (55%), Final Exam (45%) **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.

AMME5271
Computational Nanotechnology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 3 hrs/week. **Assumed knowledge:** The students will require 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

AMME9961
Biomechanics and Biomaterials

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 3 hours per week **Prohibitions:** AMME5961 **Assumed knowledge:** Chemistry, Biology, Materials Engineering, and Engineering Design at least at the Junior level. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course is divided into two parts: biomechanics and biomaterials:

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.

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 metals, then polymers (thermoplastic, thermosetting, and biodegradable), and finally ceramics (bioinert, biodegradable, and bioactive).

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

MECH5304
Materials Failure

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 3 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Students will attend a series lectures on failure analyses of engineering materials addressing brittle rupture/fracture, yielding, cleavage fracture, fatigue and creep failure of engineering materials under static and dynamic loads. Students will also attend short introduction courses on optical microscopy and scanning electron microscopy (SEM) to gain some essential knowledge in diagnostic and forensic analyses of materials failure. Each student participates in a couple of group projects relevant to diagnostic analyses of failure of typical engineering materials such as steel, aluminium, magnesium alloys, engineering plastics and advanced fibre composites. Under the guidance of the supervisor, the student will learn how to initiate a proposal on failure analysis, how to do the project investigation and how to prepare and carry out technical communications (oral presentation and discussion between groups). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.

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:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 3 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The UoS covers the key knowledge of most smart materials such as dielectric, piezoelectric, magneto-electric and shape memory materials. Each student participates in a couple of group projects relevant to characterization of structure-property relationship of functional structures with desired performance. Under the guidance of the supervisor, the student will learn how to develop a proposal, how to do the project investigation and how to prepare and carry out the technical communications (writing and oral). In any of these scenarios, the student is directly responsible for the progress and quality of the results. At the end of the semester, the student is required to submit a written project report and to give a seminar presenting the aims and achievements of the project.

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:** Lecture 2 hrs/week; Tutorial 3 hrs/week; Laboratory 3 hrs. **Prohibitions:** MECH4310 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Advanced polymer matrix composites, smart/functional materials, high-strength ferrous and non ferrous alloys, superalloys, high performance polymers, eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability.

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.

MECH5416
Advanced Design and Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

1. 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.

2. 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.

3. 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.

Design and Manufacturing

AERO5010
Optimisation Methods in Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - own time 10 hrs/week. **Assumed knowledge:** BE in the area of Aerospace or related Engineering field. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. Note: Department Permission required for Enrolment

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.

Note: Department Permission required for enrolment

AERO9301
Applied Finite Element Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** 2.5 hours of lectures and 2 hours of workgroup session per week **Prerequisites:** AERO9360 OR AERO5310 OR MECH9361 OR MECH5361 **Prohibitions:** AERO5301 **Assumed knowledge:** BE in area of Aerospace Engineering or related Engineering field. **Assessment:** Through semester assessment (55%), Final Exam (45%) **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.

AMME5310
Engineering Tribology

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs; Tutorial 3 hrs/week; Seminar 3 hrs/week. **Assumed knowledge:** (AMME2302 OR AMME9302) AND (AMME2301 OR AMME9301) AND (MECH3261 OR MECH9261) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim is to teach students in the undergraduate and postgraduate levels basic concepts about friction, lubrication and wear applicable to design and operation of mechanical systems used in engineering, industrial, and modern applications. Examples of these systems are lubrication of internal combustion engines, gearboxes, artificial hip/knee joints, and micro/nano electromechanical systems.

AMME5510
Vibration and Acoustics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** (AMME2301 OR AMME9301) AND AMME2200 AND (AMME2500 OR AMME9500) **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This UoS should prepare the student to be able to undertake vibration and acoustic measurement calculations for industry design situations.

The unit aims to introduce a number of new concepts required for analysis of vibrations and acoustics. The response of structure under different dynamic forces, including human and aerodynamic, will be investigated. A number of hands-on experiments will be performed to allow an understanding of the concepts and applicability.

The acoustics component will include: basic acoustics theory, sound generation and propagation, impedance, absorbing materials, industrial noise sources, isolation methods of noise control, enclosures, instrumentation and measurement, frequency analysis, noise regulations and computational acoustics.

AMME5602
Product Life Cycle Design

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 5 hrs/week. **Assumed knowledge:** Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This subject covers 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.

AMME5902
Advanced Computer Aided Manufacturing

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class, Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory, Seminar, **Assessment:** Through semester assessment (100%) **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

oHow to successfully complete a CAD/CAM and CNC mill based project.

oManufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;

oThe science in designing and selecting a manufacturing method.

oHow to effectively present your ideas and outcomes using oral and report based methods.

It is expected that through your hard work in the semester, you will find

oEnhanced learning by real-world problems.

oImproved comprehensive skill in manufacturing design.

AMME5912
Crash Analysis and Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - own time, **Assumed knowledge:** Computer Aided Drafting, Basic FEA principles and Solid Mechanics **Assessment:** Through semester assessment (100%) **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-PreSys, 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.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

MECH5416
Advanced Design and Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

1. 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.

2. 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.

3. 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.

Mechatronics

AERO9760
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. **Prohibitions:** AERO5760 **Assessment:** Through semester assessment (100%) **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.

AMME5520
Advanced Control and Optimisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Research 1 hr/week. **Prerequisites:** AMME3500 OR AMME5501 OR AMME9501 **Assumed knowledge:** Students have an interest and a strong understanding of feedback control systems, specifically in the area of system modelling and control design in the frequency domain. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces engineering design via optimization, i.e. finding the "best possible" solution to a particular problem. For example, an autonomous vehicle must find the fastest route between two locations over a road network; a biomedical sensing device must compute the most accurate estimate of important physiological parameters from noise-corrupted measurements; a feedback control system must stabilize and control a multivariable dynamical system (such as an aircraft) in an optimal fashion.

The student will learn how to formulate a design in terms of a "cost function", when it is possible to find the "best" design via minimization of this "cost", and how to do so. The course will introduce widely-used optimization frameworks including linear and quadratic programming (LP and QP), dynamic programming (DP), path planning with Dijkstra's algorithm, A*, and probabilistic roadmaps (PRMs), state estimation via Kalman filters, and control via the linear quadratic regulator (LQR) and Model Predictive Control (MPC). There will be constant emphasis on connections to real-world engineering problems in control, robotics, aerospace, biomedical engineering, and manufacturing.

AMME5602
Product Life Cycle Design

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 5 hrs/week. **Assumed knowledge:** Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This subject covers 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.

AMME5902
Advanced Computer Aided Manufacturing

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class, Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory, Seminar, **Assessment:** Through semester assessment (100%) **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

oHow to successfully complete a CAD/CAM and CNC mill based project.

oManufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;

oThe science in designing and selecting a manufacturing method.

oHow to effectively present your ideas and outcomes using oral and report based methods.

It is expected that through your hard work in the semester, you will find

oEnhanced learning by real-world problems.

oImproved comprehensive skill in manufacturing design.

AMME5951
Fundamentals of Neuromodulation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Implantable microelectronic devices functioning either as nerve stimulators or nerve blockers comprise one of the largest markets in the global medical device industry. The aim of this unit of study is to give students a complete overview of the underlying technology (microelectronics, encapsulation biomaterials, electrode biomaterials, electrode-neural interactions, inductive power systems and data links, signal processing) and an expert review of the major technological applications on the market, which include Cochlear implants, pacemakers and implantable defibrillators, deep brain stimulators, pain control nerve blockers, bionic eye implants, functional electrical stimulation systems. The unit will also review emerging applications such as gastrointestinal disorders, obesity; vagal nerve stimulation - epilepsy, depression, carotid artery stimulation - hypertension, spinal cord stimulation - ischemic disorders, angina, peripheral vascular disease, incontinence, erectile dysfunction. The unit will conclude with a snapshot of the future: "brain on a chip" progress, nerve regrowth, neurotropins, drug/device combinations. This is a Master of Professional Engineering Unit of Study intended for biomedical engineering students with an interest in working in the medical device industry in the large market sector area of implantable electronic devices.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

MECH5416
Advanced Design and Analysis

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/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 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

1. 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.

2. 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.

3. 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.

MECH5720
Sensors and Signals

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 3 hrs/week; Project Work - own time 2 hrs/week; Presentation 2 hrs; Laboratory 2 hrs; Tutorial 2 hrs/week. **Prohibitions:** MECH4720 **Assumed knowledge:** Strong MATLAB skills **Assessment:** Through semester assessment (75%) Final Exam (25%) **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: Convolution, The Fourier Transform, Modulation (FM, AM, FSK, PSK etc), Frequency shifting (mixing)

b) PASSIVE SENSORS: Infrared Radiometers, Imaging Infrared, Passive Microwave Imaging, Visible Imaging & Image Intensifiers

c) ACTIVE SENSORS THE BASICS: Operational Principles, Time of flight (TOF) Measurement & Imaging of Radar, Lidar and Sonar, Radio Tags and Transponders, Range Tacking, 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.

MTRX5700
Experimental Robotics

Credit points: 6 **Session:** Semester 1 **Classes:** Laboratory 3 hrs/week; Lecture 2 hrs/week. **Prerequisites:** (AMME3500 OR AMME9501) AND MTRX3700 **Assumed knowledge:** Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed. **Assessment:** Through semester assessment (70%) Final Exam (30%) **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 manufacturing, automobile systems and assembly systems; develop the capacity to think critically 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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units AMME5020 and AMME5022 (total 18 cp) in place of Capstone Project AMME5021 and 6 cp of elective units.

AMME5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study). **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Corequisites:** AMME5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The capstone project 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. Capstone project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Project 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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

AMME5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B Extended covers the second of stage writing up and presenting the research results. This extended version of Capstone Project allows the student to investigate a topic of greater depth and scope.

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 project itself. The final capstone report 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 submission. The report 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 project at this level will represent a significant contribution to new knowledge; nor is it expected that projects will resolve great intellectual problems. The timeframe available for the project 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.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units AMME5222 and AMME5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

AMME5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

AMME5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a dissertation project, students must first secure an academic supervisor in an area that they are interested. Students must have acieved a WAM of 75% or greater in their prior year of study. The topic of your project must be determined in discussion with the supervisor.

Dissertation 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 individual engineering and scientific 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. Dissertation is undertaken across two semesters of enrolment, in two successive Units of Study of 12 credits points each. Dissertation A covers first steps of thesis research starting with development of research proposal. Dissertation 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 project itself. The final capstone report must be the student's individual work. 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 expected that a project at this level will represent a contribution to new knowledge meeting the level of a postgraduate research degree.

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Power Engineering

Course overview

A postgraduate specialisation in Power Engineering is concerned with the study of power systems, specifically electric power generation, electric power transmission and electric power distribution, power conversion, and electromechanical devices.

This will provide you with advanced skills to plan, design, construct, operate and maintain power systems and equipment.

Areas of study include high-voltage engineering, sustainable energy systems and power systems analysis and protection.

This degree has been given full accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia.

Course requirements

Candidates for the Master of Professional Engineering (Power Engineering) complete 144 credit points as listed in the unit of study table.

They also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Master of Professional Engineering (Power)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One			
Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
COMP9129 **Software Construction**	6	**A** Some prior knowledge of programming is preferred; for students without programming experience, extra assistance is given in the first 6 weeks of the semester. **N** COMP5212	Semester 1
ELEC9703 **Fundamentals of Elec and Electronic Eng**	6	**A** Basic knowledge of differentiation & integration, and HSC Physics **N** ELEC5710	Semester 1
ELEC9602 **Digital Logic**	6	**A** This unit of study assumes some knowledge of digital data representation and basic computer organisation. **N** ELEC5722	Semester 1
ENGG5011 **Foundation Engineering Studies A**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Main
Year One - Semester Two			
ELEC9103 **Simulations and Numerical Solutions in Eng**	6	**A** ELEC9703. Understanding of the fundamental concepts and building blocks of electrical and electronics circuits and aspects of professional project management, teamwork, and ethics. **N** : ELEC5723 OR ELEC2103 OR COSC1001 OR COSC1901	Semester 2
ELEC9302 **Signals and Systems**	6	**A** Basic knowledge of differentiation & integration, differential equations, and linear algebra. **N** ELEC5721	Semester 2
ELEC9601 **Computer Systems**	6	**A** HSC Mathematics extension 1 or 2 **N** ELEC5711	Semester 2
ELEC9704 **Electronic Devices and Circuits**	6	**A** 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. **N** : ELEC5720 OR ELEC2104	Semester 2
Year Two - Semester One			
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
ENGG5204 **Engineering Professional Practice**	6	**A** Competences and experience in engineering obtained during an accepted engineering degree	Semester 1
Select 12 credit points from the Foundation units block.			
Year Two - Semester Two			
Select 12 credit points from the Foundation units block. Candidates complete 24 credit points of Foundation units across Year Two.			
Select 12 credit points from the Specialist units block, the Elective units block or the Management Elective units block. Candidates complete 36 credit points of specialist units, 12 credit points of Electives and 12 credit points of Management Electives across Year Two and Year Three.			
Year Three - Semester One			
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5020 and 6cp of recommended electives with ELEC5222 Dissertation A.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Select 18 credit points from the Specialist units block, the Elective units block or the Management Elective units block..			
Candidates complete 36 credit points of specialisy units, 12 credit points of Electives and 12 credit points of Management Electives across Year Two and Year Three.			
Year Three - Semester Two			
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5021 and 6cp of recommended electives with ELEC5223 Dissertation B.			
Select 18 credit points from the Specialist units block, the Elective units block or the Management Elective units block..			
Candidates complete 36 credit points of specialist units, 12 credit points of Electives and 12 credit points of Management Electives across Year Two and Year Three.			
Foundation units			
Candidates must complete 24 credit points from the following Foundation units of study.			
ELEC9203 **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** ELEC3203 OR ELEC5732	Semester 1
ELEC9204 **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. **N** ELEC5733	Semester 1
ELEC9206 **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. **N** ELEC5734	Semester 2
ELEC9304 **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. **N** ELEC5735	Semester 2
Specialist units			
Candidates must complete 36 credit points from the following Specialis units of study.			
ELEC5203 **Topics in Power Engineering**	6	**A** ELEC3203 Power Engineering and ELEC3204 Power Electronics and Drives.Familiarity with basic mathematics and physics; competence with basic circuit theory and understanding of electricity grid equipment such as transformers, transmission lines and associated modeling; and fundamentals of power electronic technologies.	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.	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. **P** ELEC3203 OR ELEC9203	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
ELEC5207 **Advanced Power Conversion Technologies**	6	**A** ELEC3204	Semester 2
ELEC5208 **Intelligent Electricity Networks**	6	**A** Fundamentals of Electricity Networks, Control Systems and Telecommunications	Semester 1
ELEC5211 **Power Systems Dynamics and Control**	6	**A** The pre-required knowledge for learning this UoS is a deep understanding on circuit analysis and its applications in power system steady state analysis. **P** ELEC3203 OR ELEC9203 OR ELEC5732	Semester 1
ELEC5212 **Power Systems Planning and Markets**	6	**A** The pre-required knowledge for learning this UoS is power system steady state analysis **P** ELEC3203 OR ELEC9203	Semester 2
Elective units			
Candidates must complete 12 credit points from the following Elective units of study.			
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. *Note: Department permission required for enrolment*	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	Semester 2
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3305, ELEC3506, ELEC3607 and ELEC5508	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5516 **Electrical and Optical Sensor Design**	6	**A** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis	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) **N** MECH5701	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2

Management Elective units

Candidates must complete 12 credit points from the following Management Elective units of study.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5203 **Quality Engineering and Management**	6	**A** First degree in Engineering or a related discipline	Semester 2
ENGG5205 **Professional Practice in PM**	6	*This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.*	Semester 1 Semester 2
ENGG5214 **Management of Technology**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
ENGG5215 **International Eng Strategy & Operations**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
ENGG5216 **Management of Engineering Innovation**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 1

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.

Extended Capstone Project candidates take Capstone Project units ELEC5020 and ELEC5022 (total 18 cp) in place of Capstone Project ELEC5021 and 6 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
ELEC5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption *Note: Department permission required for enrolment*	Semester 1 Semester 2

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.

Research pathway candidates take Dissertation units Research pathway students take Dissertation units ELEC5222 and ELEC5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5222 **Dissertation A**	12	**N** ENGG5222, ELEC8902, ENGG5223, ELEC8901 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
ELEC5223 **Dissertation B**	12	**N** ELEC8901, ELEC8902, ENGG5223, ENGG5222 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Power)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

COMP9129
Software Construction

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Laboratory: 1 hours per week **Prohibitions:** COMP5212 **Assumed knowledge:** Some prior knowledge of programming is preferred; for students without programming experience, extra assistance is given in the first 6 weeks of the semester. **Assessment:** Through semester assessments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a programming unit of study that is designed to enable students, coming from any background, to learn to program in the C language, with emphasis on the individual producing code that works correctly. as a gentler start to C itself, the unit starts with Python, introducing the same core ideas. Once students have mastered this, we move to C, tackling the same deep ideas in the context of the much more difficult programming in C.

Topics include: 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.

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.

ELEC9703
Fundamentals of Elec and Electronic Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 3 hours per week; Laboratory: 3 hours per week; Tutorial: 2 hours per week **Prohibitions:** ELEC5710 **Assumed knowledge:** Basic knowledge of differentiation & integration, and HSC Physics **Assessment:** Through semester assessment (40%), Final Exam (60%) **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

ELEC9602
Digital Logic

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures, 2 hours of tutorials and 3 hours of laboratory work per week. **Prohibitions:** ELEC5722 **Assumed knowledge:** This unit of study assumes some knowledge of digital data representation and basic computer organisation. **Assessment:** Through semester assessment (30%), Final Exam (70%) **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.

ENGG5011
Foundation Engineering Studies A

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Main **Classes:** Project Work - own time 8 hrs. **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

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.

Year One - Semester Two

ELEC9103
Simulations and Numerical Solutions in Eng

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hours per week, Laboratory 3 hours per week. **Prohibitions:** : ELEC5723 OR ELEC2103 OR COSC1001 OR COSC1901 **Assumed knowledge:** ELEC9703. Understanding of the fundamental concepts and building blocks of electrical and electronics circuits and aspects of professional project management, teamwork, and ethics. **Assessment:** Through semester assesment (25%), Final Exam (75%) **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.

ELEC9302
Signals and Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 1 hours per week; Laboratory: 2 hours per week; Tutorial: 2 hours per week; E-Learning: 1 hours per week **Prohibitions:** ELEC5721 **Assumed knowledge:** Basic knowledge of differentiation & integration, differential equations, and linear algebra. **Assessment:** Through semester assessment (30%), Final Exam (70%) **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.

ELEC9601
Computer Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 3 hours per week; Tutorial: 2 hours per week **Prohibitions:** ELEC5711 **Assumed knowledge:** HSC Mathematics extension 1 or 2 **Assessment:** Through semesteer assessment (59%), Final Exam (41%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces the fundamental digital concepts upon which the design and operation of modern digital computers are based. A prime aim of the unit is to develop a professional view of, and a capacity for inquiry into, the field of computing.

Topics covered include: data representation, basic computer organisation, the CPU, elementary gates and logic, peripheral devices, software organisation, machine language, assembly language, operating systems, data communications and computer networks.

ELEC9704
Electronic Devices 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:** : ELEC5720 OR ELEC2104 **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. **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 ELEC9703 is assumed.

Year Two - Semester One

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

ENGG5204
Engineering Professional Practice

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Competences and experience in engineering obtained during an accepted engineering degree **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This UoS is designed to provide graduate engineers studying for a Master of Professional Engineering degree 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, basic knowledge of the law of contracts and legal responsibility, 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.

Select 12 credit points from the Foundation units block.

Year Two - Semester Two

Select 12 credit points from the Foundation units block.

Candidates complete 24 credit points of Foundation units across Year Two.

Select 12 credit points from the Specialist units block, the Elective units block or the Management Elective units block.

Candidates complete 36 credit points of specialist units, 12 credit points of Electives and 12 credit points of Management Electives across Year Two and Year Three.

Year Three - Semester One

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5020 and 6cp of recommended electives with ELEC5222 Dissertation A.

Select 18 credit points from the Specialist units block, the Elective units block or the Management Elective units block..

Candidates complete 36 credit points of specialisy units, 12 credit points of Electives and 12 credit points of Management Electives across Year Two and Year Three.

Year Three - Semester Two

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5021 and 6cp of recommended electives with ELEC5223 Dissertation B.

Select 18 credit points from the Specialist units block, the Elective units block or the Management Elective units block..

Candidates complete 36 credit points of specialist units, 12 credit points of Electives and 12 credit points of Management Electives across Year Two and Year Three.

Foundation units

Candidates must complete 24 credit points from the following Foundation units of study.

ELEC9203
Electricity Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; Laboratory: 3 hours per week **Prohibitions:** ELEC3203 OR ELEC5732 **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. **Assessment:** Through semester assessment (60%), Final Exam (40%) **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 conditions. Transmission lines: calculation of parameters, modelling, analysis. Transformers: construction, equivalent circuits. Generators: construction, modelling for steady state operation. The use of per unit system. The analysis of systems with a number of voltage levels. The load flow problem: bus and impedance matrices, solution methods. Power system transient stability. The control of active and reactive power. Electricity markets, market structures and economic dispatch. Types of electricity grids, radial, mesh, networks. Distribution systems and smart grids.

ELEC9204
Power Electronics and Applications

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Laboratory: 3 hours per week; Tutorial: 2 hours per week. **Prohibitions:** ELEC5733 **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. **Assessment:** Through semester assessment (45%), Final Exam (55%) **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.

ELEC9206
Electrical Energy Conversion Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Tutorial: 2 hours per week; Laboratory: 3 hours per week **Prohibitions:** ELEC5734 **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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

ELEC9304
Control

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and a 3 hours lab/tutorial per week. **Prohibitions:** ELEC5735 **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. **Assessment:** Through semester assessment (43%), Final Exam (57%) **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

Specialist units

Candidates must complete 36 credit points from the following Specialis units of study.

ELEC5203
Topics in Power Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial-Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3203 Power Engineering and ELEC3204 Power Electronics and Drives.Familiarity with basic mathematics and physics; competence with basic circuit theory and understanding of electricity grid equipment such as transformers, transmission lines and associated modeling; and fundamentals of power electronic technologies. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides the basis for the analysis of electricity grids using symmetrical components theory. Such analysis theory is the basis for the understanding of electrical faults and the design of protection strategies to safeguard the electrical equipment, and maintain safety of the plant at the highest possible level.

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:** Lecture 2 hrs/week; Tutorial - Laboratory 2 hrs/week; Project Work - in class 2 hrs. **Prerequisites:** ELEC3203 OR ELEC9203 **Assumed knowledge:** The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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:** Lecture 2 hrs/week; Tutorial 2 hrs/fortnight; Laboratory 2 hrsfortnight; Project Work - own time 2 hrs/week. **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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 power system both at distribution and transmission levels. 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 intelligent electricity networks and advanced energy conversion and power systems. The following topics are covered: modern power systems; distributed generation; co-generation; tri-generation; microturbines; fuel cells; renewable energy sources: solar, wind, hydro, biomass, wind turbines; photovoltaic; grid-connected power systems; stand-alone power systems.

ELEC5207
Advanced Power Conversion Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial - Laboratory 3 hrs/week; Project Work - own time 2 hrs/week. **Assumed knowledge:** ELEC3204 **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to cover advanced topics in power electronics and it applications. In particular, the power electronics interface design and implementation for microgrid, smart grids and modern power systems which have received tremendous attention in recent years. Many countries including Australia are developing different power electronics technologies such as integrating renewable energy sources into the grid, managing charging and discharging of high power energy storage system, controlling the reactive power of power electronics interfaces for grid stability, and adding communication capability to power electronics interfaces for smart meter implementation. The unit assumes prior fundamental knowledge of power electronics systems and applications, including the ability to analyse basic power converters for all four conversions (ac-ac, ac-dc, dc-ac, and ac-dc), and design and implement various applications, such as motor drive and battery charger, with the consideration of electrical characteristics of semiconductors and passive elements. This unit will cover advanced technologies on power electronics interfaces for smart grids and microgrid implementation, which include dynamic voltage restorer, active power filter, reactive power compensation, energy storage management, hybrid energy sources optimisation, multilevel inverter and control, D-STATCOM, etc. To analyse these advanced power conversion systems, some analytical techniques will be introduced. This includes resonant converters, soft-switching technique, ac equivalent circuit modeling, converter control and input/output filter design.

ELEC5208
Intelligent Electricity Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs/. **Assumed knowledge:** Fundamentals of Electricity Networks, Control Systems and Telecommunications **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aims to give students an introduction to the planning and operation of modern electricity grids, also known as "smart" grids. Traditional power networks featured a small number of large base-load plants sending power out over transmission lines to be distributed in radial lower voltage networks to loads. In response to the need to reduce carbon impact, future networks will feature diverse generation scattered all over the network including at distribution levels. Also there will be new loads such as electric vehicles and technologies including energy storage and lower voltage power flow control devices. The operation of these new networks will be possible by much greater use of information and communication technology (ICT) and control over the information networks.

The unit will cover recent relevant developments in energy technologies as well as important components of 'smart grids' such as supervisory control and data acquisition (SCADA), substation automation, remote terminal units (RTU), sensors and intelligent electronic devices (IED). Operation of these electricity grids requires a huge amount of data gathering, communication and information processing. The unit will discuss many emerging technologies for such data, information, knowledge and decision processes including communication protocols and network layouts, networking middleware and coordinated control. Information systems and data gathering will be used to assess key performance and security indicators associated with the operation of such grids including stability, reliability and power quality.

ELEC5211
Power Systems Dynamics and Control

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** ELEC3203 OR ELEC9203 OR ELEC5732 **Assumed knowledge:** The pre-required knowledge for learning this UoS is a deep understanding on circuit analysis and its applications in power system steady state analysis. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit deals with power systems modelling, analysis and simulation under dynamic conditions. The unit will cover the following topics:

- The links between power system steady state analysis and transient analysis

- Basics of dynamic system in general and stability analysis methods;

- Analysis of power systems subject to electromagnetic and electromechanical transients

- Power system modelling for stability analysis and electromagnetic transients analysis: Synchronous machine modelling using Park's transformation; Modelling of excitation systems and turbine governors; Modelling of the transmission system; Load modelling.

- Simulation of interconnected multi-machine systems

- Stability analysis: Transient stability; Small signal stability; Voltage stability;

- Power system control: Voltage control; Power system transient stability control; Power system dynamic stability control; Emergency control.

The unit is a specialist Unit for MPE (Power) and ME (Electrical and Power). It is also available as a recommended elective for BE Electrical (Power).

ELEC5212
Power Systems Planning and Markets

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/fortnight. **Prerequisites:** ELEC3203 OR ELEC9203 **Assumed knowledge:** The pre-required knowledge for learning this UoS is power system steady state analysis **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Deregulation of the electricity industry has fundamentally changed the power systems operation paradigm. The focus has shifted from central planning of vertically integrated utilities to market driven operation. Traditional electric energy producers and consumers play new roles in a power market environment and their behaviors are affected by the economic incentives to a large extent. Nevertheless, electric energy is a special commodity and cannot be traded as the other common goods. So a power market design has many special considerations compared with a conventional commercial market design. Knowledge of the power market mechanisms has become a necessary part in fully understanding the whole power system operations. To equip students with necessary skills to address the challenges of modern power systems, the unit will cover the following topics:

- Overview of the traditional electricity industry structure and operation: Economic dispatch, Power system operation states and respective reliability requirements.

- Drivers for the restructuring of the electricity industry.

- Electricity market design: Market structures (spot, bilateral, hybrid) ; Energy market; Ancillary services market; Key components in an electricity market;

- Electricity market participants and their roles in a market.

- Electricity economics: Power market from suppliers' view (Supply curve) and from demands' view (Demand curve); Market mechanism; Price and its elasticity; Cost and supply; Market power and monopoly.

- Cost of capital: Time value of money; Project evaluation methods from investments' point of view; Risk and return;

- Operation mechanisms of various designs of power markets;

- Power market practices around the world;

- Power system expansion planning: Fundamental knowledge of power system planning considerations, procedures and methods;

Transmission planning; Generation planning; Power system adequacy assessment.

ELEC5212 is a specialist Unit for MPE (Power) and ME (Electrical and Power). It is also available as a recommended elective for BE Electrical (Power). This unit focuses on the power market principles and practices. Based on the knowledge of the power market operation, the power system planning procedures and methods will also be discussed.

Elective units

Candidates must complete 12 credit points from the following Elective units of study.

ELEC5303
Computer Control System Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory. **Assessment:** Through semester assessment (44%) Final Exam (56%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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.

ELEC5511
Optical Communication Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3305, ELEC3506, ELEC3607 and ELEC5508 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aim to teach the fundamentals concepts associated with:

oNetworked Embedded Systems, wireless sensor networks

oWireless channel propagation and radio power consumption

oWireless networks, ZigBee, Bluetooth, etc.

oSensor principle, data fusion, source detection and identification

oMultiple source detection, multiple access communications.

oNetwork topology, routing, network information theory

oDistributed source channel coding for sensor networks

oPower-aware and energy-aware communication protocols.

oDistributed embedded systems problems such as time synchronization and node localization,

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.

oAbility to identify the main issues and trade-offs in networked embedded systems.

oUnderstanding of the state-of-the-art solutions in the area

oBased on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.

oFamiliarization with a simulator platform and real hardware platforms for network embedded systems through the students involvement in project

ELEC5516
Electrical and Optical Sensor Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hours per week; Tutorial 1 hour per week; E-Learning 1 hour per week; Laboratory: 8 hours overall. **Assumed knowledge:** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The course focuses on environmentally friendly, intelligent sensors for multiple parameters monitoring to be used in power network and broadband network. The concepts learnt in this unit will be heavily used in various engineering applications in power systems, fiber optic systems and health monitoring. These concepts include:

-Theory, design and applications of optical fiber sensors.

-Sensor technologies for the growth of smart grid in power engineering.
-Actuators and motors for electrical sensor and its applications.

-Wearable sensor technologies for ehealth monitoring.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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.

ELEC5620
Model Based Software Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

Management Elective units

Candidates must complete 12 credit points from the following Management Elective units of study.

ENGG5203
Quality Engineering and Management

Credit points: 6 **Session:** Semester 2 **Classes:** Presentation 2 hrs/week; Project Work - in class 2 hrs/week; Project Work - own time 6 hrs. **Assumed knowledge:** First degree in Engineering or a related discipline **Assessment:** Through semester assessment (100%) **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 control and management as well as systems assurance processes. 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.

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hrs/week; E-Learning 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.

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 expertis.

ENGG5214
Management of Technology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Uos is designed to develop competence in the management of technology. It will address all aspects of the management of technology, the nature and importance of technological change and innovation, within the context of the global knowledge economy, the management of the new product development process, the role of technology in manufacturing and service competitiveness, the role of IT in logistics management, supply chain strategies, and communication, and the characteristics of high technology markets.

ENGG5215
International Eng Strategy & Operations

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - in class 2 hr/week for half the semester. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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 1 hr/week; Tutorial 1 hr/week; Presentation 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. Extended Capstone Project candidates take Capstone Project units ELEC5020 and ELEC5022 (total 18 cp) in place of Capstone Project ELEC5021 and 6 cp of elective units.

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B covers the second of stage writing up and presenting the research results, and Capstone Project B extended allows the student to investigate a topic of greater depth and scope.

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.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units Research pathway students take Dissertation units ELEC5222 and ELEC5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

ELEC5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5222, ELEC8902, ENGG5223, ELEC8901 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

ELEC5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ELEC8901, ELEC8902, ENGG5223, ENGG5222 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Software Engineering

Course overview

From the evolving Internet, to the growth of mobile, handheld and embedded devices, the critical need for engineers who can build our virtual world gets greater by the day.

Software engineering addresses all aspects of software production, from strategy and design to coding, quality and management.

This degree has been given provisional accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia.

Course requirements

Candidates for the Master of Professional Engineering (Software Engineering) complete 144 credit points as listed in the unit of study table.

They also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Software)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One			
Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
COMP9007 **Algorithms**	6	**A** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **N** COMP5211	Semester 2
ELEC9602 **Digital Logic**	6	**A** This unit of study assumes some knowledge of digital data representation and basic computer organisation. **N** ELEC5722	Semester 1
ENGG5011 **Foundation Engineering Studies A**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Main
INFO5301 **Information Security Management**	6	**A** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable.	Semester 1
Year One - Semester Two			
COMP9120 **Database Management Systems**	6	**A** Some exposure to programming and some familiarity with data model concepts **N** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content.	Semester 1 Semester 2
ELEC9302 **Signals and Systems**	6	**A** Basic knowledge of differentiation & integration, differential equations, and linear algebra. **N** ELEC5721	Semester 2
ELEC9601 **Computer Systems**	6	**A** HSC Mathematics extension 1 or 2 **N** ELEC5711	Semester 2
ELEC9704 **Electronic Devices and Circuits**	6	**A** 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. **N** : ELEC5720 OR ELEC2104	Semester 2
Year Two - Semester One			
COMP9220 **Object-Oriented Design**	6	**A** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **N** : COMP5028 OR INFO3220	Semester 1
COMP5348 **Enterprise Scale Software Architecture**	6	**A** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.	Semester 1
INFO5990 **Professional Practice in IT**	6	**A** Students enrolled in INFO5990 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have many years experience as a practising IT professional. *The main focus of the subject is to provide students with the necessary tools, basic skills, experience and adequate knowledge so they develop an awareness and an understanding of the responsibilities and issues associated with professional conduct and practice in the information technology sector.*	Semester 1 Semester 2
Select 6 credit points from Specialist Electives units block.			
Year Two - Semester Two			
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5615 **Software Engineering Project**	6	**P** INFO6007 **N** INFO3600, COMP3615 *Note: Department permission required for enrolment* *department permission required for enrolment*	Semester 2

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
ELEC9609 **Internet Software Platforms**	6	**N** ELEC5742	Semester 2
Select 6 credit points from Specialist Electives units block.			
Year Three - Semester One			
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5020 and 6cp of recommended electives with ELEC5222 Dissertation A.			
Select 6 credit points from Specialist Electives units block.			
Select 6 credit points from Management Electives units block.			
Year Three - Semester Two			
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
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. *Note: Department permission required for enrolment*	Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5021 and 6cp of recommended electives with ELEC5223 Dissertation B.			
Select 6 credit points from Management Electives units block.			
Specialist Elective units Candidates must complete 18 credit points from the following table of Specialist Elective units of study.			
COMP5338 **Advanced Data Models**	6	**A** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1).	Semester 2
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	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) **N** MECH5701	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2
Management Elective units Candidates must complete 12 credit points from the following Management Elective units of study.			
ENGG5214 **Management of Technology**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
ENGG5215 **International Eng Strategy & Operations**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
ENGG5216 **Management of Engineering Innovation**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 1
INFO6007 **Project Management in IT**	6	**A** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **N** PMGT5871	Semester 1 Semester 2
Project units All candidates are required to complete a minimum of 12 credit points of Project units. Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. Extended Capstone Project candidates take Capstone Project units ELEC5020 and ELEC5022 (total 18 cp) in place of Capstone Project ELEC5021 and 6 cp of elective units.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
ELEC5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption *Note: Department permission required for enrolment*	Semester 1 Semester 2

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.

Research pathway candidates take Dissertation units Research pathway students take Dissertation units ELEC5222 and ELEC5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5222 **Dissertation A**	12	**N** ENGG5222, ELEC8902, ENGG5223, ELEC8901 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
ELEC5223 **Dissertation B**	12	**N** ELEC8901, ELEC8902, ENGG5223, ENGG5222 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Software)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

COMP9007
Algorithms

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour lectures and one 1 hour tutorial per week. **Prohibitions:** COMP5211 **Assumed knowledge:** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 computational thinking from simple list manipulation and data format conversion, up to shortest paths and cycle detection in graphs. Students will gain essential knowledge in computer science, including basic concepts in data structures, algorithms, and intractability, using paradigms such as dynamic programming, divide and conquer, greed, local search, and randomisation, as well NP-hardness.

ELEC9602
Digital Logic

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures, 2 hours of tutorials and 3 hours of laboratory work per week. **Prohibitions:** ELEC5722 **Assumed knowledge:** This unit of study assumes some knowledge of digital data representation and basic computer organisation. **Assessment:** Through semester assessment (30%), Final Exam (70%) **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.

ENGG5011
Foundation Engineering Studies A

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Main **Classes:** Project Work - own time 8 hrs. **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

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.

INFO5301
Information Security Management

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study gives a broad view of the management aspects of information security. We emphasise corporate governance for information security, organisational structures within which information security is managed, risk assessment, and control structures. Planning for security, and regulatory issues, are also addressed.

Year One - Semester Two

COMP9120
Database Management Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 2 hour tutorial per week. **Prohibitions:** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content. **Assumed knowledge:** Some exposure to programming and some familiarity with data model concepts **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

Note that the first two thirds of the lectures of this foundational unit will be co-taught with the corresponding undergraduate class in semester 1 (INFO2120); tutorials and assignments will be organised separately.

ELEC9302
Signals and Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 1 hours per week; Laboratory: 2 hours per week; Tutorial: 2 hours per week; E-Learning: 1 hours per week **Prohibitions:** ELEC5721 **Assumed knowledge:** Basic knowledge of differentiation & integration, differential equations, and linear algebra. **Assessment:** Through semester assessment (30%), Final Exam (70%) **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.

ELEC9601
Computer Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 3 hours per week; Tutorial: 2 hours per week **Prohibitions:** ELEC5711 **Assumed knowledge:** HSC Mathematics extension 1 or 2 **Assessment:** Through semesteer assessment (59%), Final Exam (41%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces the fundamental digital concepts upon which the design and operation of modern digital computers are based. A prime aim of the unit is to develop a professional view of, and a capacity for inquiry into, the field of computing.

Topics covered include: data representation, basic computer organisation, the CPU, elementary gates and logic, peripheral devices, software organisation, machine language, assembly language, operating systems, data communications and computer networks.

ELEC9704
Electronic Devices 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:** : ELEC5720 OR ELEC2104 **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. **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 ELEC9703 is assumed.

Year Two - Semester One

COMP9220
Object-Oriented Design

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** : COMP5028 OR INFO3220 **Assumed knowledge:** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces essential object-oriented design methods and language mechanisms, especially the principles of modelling through Rational Unified Process and agile processes using Unified Modeling Language (UML) and Java or C++, both of which are industry standard. Students work in small groups to experience the process of object-oriented analysis, object-oriented design, implementation and testing by building a real-world application. Java or C++ is used as the implementation language and a special emphasis is placed on those features of Java or C++ that are important for solving real-world problems. Advanced software engineering features, including exceptions and name spaces are thoroughly covered.

COMP5348
Enterprise Scale Software Architecture

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

INFO5990
Professional Practice in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students enrolled in INFO5990 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have many years experience as a practising IT professional. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: The main focus of the subject is to provide students with the necessary tools, basic skills, experience and adequate knowledge so they develop an awareness and an understanding of the responsibilities and issues associated with professional conduct and practice in the information technology sector.

This Unit of Study introduces the students to some of the concepts, standards and techniques associated with the current professional practice in information technology in the business environment.

Students will encounter a range of concepts, techniques and professional issues including interpersonal and organisational communication, human resources and conflict resolution, globalisation, professional ethics, social impacts of IT, data security, data quality assurance, system audit, investigative research and project management practice. Practical and real world case studies will be used as part of the learning to enhance the in-class teachings to the needs of industry.

Select 6 credit points from Specialist Electives units block.

Year Two - Semester Two

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

COMP5615
Software Engineering Project

Credit points: 6 **Session:** Semester 2 **Classes:** Meeting 1 hr/week; Project Work - in class 2 hrs/week; Project Work - own time 5 hrs/week; Site Visit 1 hr/week. **Prerequisites:** INFO6007 **Prohibitions:** INFO3600, COMP3615 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment. 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.

ELEC9609
Internet Software Platforms

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours lecture and 2 hours tutorials per week **Prohibitions:** ELEC5742 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

Select 6 credit points from Specialist Electives units block.

Year Three - Semester One

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5618
Software Quality Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5020 and 6cp of recommended electives with ELEC5222 Dissertation A.

Select 6 credit points from Specialist Electives units block.

Select 6 credit points from Management Electives units block.

Year Three - Semester Two

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5021 and 6cp of recommended electives with ELEC5223 Dissertation B.

Select 6 credit points from Management Electives units block.

Specialist Elective units

Candidates must complete 18 credit points from the following table of Specialist Elective units of study.

COMP5338

Advanced Data Models

Credit points: 6 **Session:** Semester 2 **Classes:** Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1). **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 data storage technology.

Particular emphasis is put on spatial, temporal, and NoSQL data storage. This unit extensively covers the advanced features of SQL:2003, as well as a few dominant NoSQL storage technologies. Besides in lectures, the advanced topics will be also studied with prescribed readings of database research publications.

COMP5426

Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

ELEC5614

Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

Management Elective units

Candidates must complete 12 credit points from the following Management Elective units of study.

ENGG5214
Management of Technology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Uos is designed to develop competence in the management of technology. It will address all aspects of the management of technology, the nature and importance of technological change and innovation, within the context of the global knowledge economy, the management of the new product development process, the role of technology in manufacturing and service competitiveness, the role of IT in logistics management, supply chain strategies, and communication, and the characteristics of high technology markets.

ENGG5215
International Eng Strategy & Operations

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - in class 2 hr/week for half the semester. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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 1 hr/week; Tutorial 1 hr/week; Presentation 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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.

INFO6007
Project Management in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture Workshop 3 hrs/week; WeeklyAssignments 5 hrs; Exam Preparation 16 hrs. **Prohibitions:** PMGT5871 **Assumed knowledge:** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers the factors necessary for successful management of a wide variety of Information Technology projects. The course covers both quantitative and qualitative aspects of project management. Topics include the management of time, scope, budget, risk, quality, and resources through each of the phases of a project.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units ELEC5020 and ELEC5022 (total 18 cp) in place of Capstone Project ELEC5021 and 6 cp of elective units.

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B covers the second of stage writing up and presenting the research results, and Capstone Project B extended allows the student to investigate a topic of greater depth and scope.

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.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units Research pathway students take Dissertation units ELEC5222 and ELEC5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

ELEC5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5222, ELEC8902, ENGG5223, ELEC8901 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

ELEC5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ELEC8901, ELEC8902, ENGG5223, ENGG5222 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution.The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution.The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Structural Engineering

Course overview

A postgraduate specialisation in Structural Engineering is concerned with the design of high-rise buildings, industrial complexes, bridges, stadiums, and sporting and exhibition centres.

You will gain an understanding of how forces, such as the weight of a building, its contents, and environmental loads, are resisted by and transferred through structures and buildings to the ground.

Areas of study include concrete structures, steel structures, numerical methods in engineering and structural dynamics.

This degree has been given full accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia.

Course requirements

Candidates for the Master of Professional Engineering (Structural Engineering) complete 144 credit points as listed in the unit of study table.

They also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Structural)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One			
Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
CIVL9110 **Materials**	6	**A** This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. **N** CIVL5501 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 1
CIVL9201 **Structural Mechanics**	6	**A** From Engineering Mechanics, 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. **N** CIVL5502 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 1
CIVL9810 **Engineering Construction and Surveying**	6	**N** CIVL5506 *This UoS includes a 2 day Engineering Construction and Survey Camp where field survey is practised and exercises in the application of field survey to Engineering Construction are also undertaken. The Camp is held 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)*	Semester 1
ENGG9802 **Engineering Mechanics**	6	**N** ENGG5802	Semester 2 Summer Main
Year One - Semester Two			
CIVL9230 **Structural Concepts and Design**	6	**A** Structural mechanics, first year mathematics, but these are not prerequisites **N** CIVL5509 *Basic structural elements include beams, columns slabs and simple frames*	Semester 2
CIVL9410 **Soil Mechanics**	6	**A** CIVL9201 OR CIVL5502. An understanding of simple statics, equilibrium, forces and bending moments, and of stress and strain and the relationship between them. This is covered by University of Sydney courses ENGG9802 Engineering Mechanics, CIVL9201 Structural Mechanics. Familiarity with the use of spreadsheets (Excel, Mathcad) to obtain solutions to engineering problems, and with the graphical presentation of this data. Familiarity with word processing packages for report presentation. Some of this is covered in the University of Sydney course ENGG9801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. **N** CIVL5504 *This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.*	Semester 2
CIVL9611 **Introductory Fluid Mechanics**	6	**A** CIVL5502 OR CIVL9201. 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 their analytical and numerical solutions **N** CIVL5505	Semester 2
GEOL1501 **Engineering Geology 1**	6	**A** No previous knowledge of Geology assumed **N** GEOS1903, GEOL1902, GEOS1003, GEOL1002	Semester 2
Year Two - Semester One			
CIVL9205 **Concrete Structures 1**	6	**A** (CIVL5501 OR CIVL9110) AND (CIVL5502 OR CIVL9201) AND (CIVL5509 OR CIVL9230). basic concepts of solid mechanics and structural mechanics, including: compatability of strains; stress-strain relationships; equilibrium; flexure, shear and torsion; statically determinate load effects (reactions, bending moments, shear forces); elastic beam theory (strains, stresses and beam deflections). **N** CIVL5507	Semester 1
CIVL9612 **Fluid Mechanics**	6	**A** (CIVL9201 OR CIVL5502) AND (CIVL9611 OR CIVL5505) AND (ENGG9802 OR ENGG5802). This unit of study follows on from Fluid Mechanics CIVL9611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. **N** CIVL5511	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL9811 **Engineering Design and 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. **N** CIVL5512 *This unit aims to prepare students for employment in a broad range of engineering areas including design, planning and construction management.*	Semester 1
ENGG5204 **Engineering Professional Practice**	6	**A** Competences and experience in engineering obtained during an accepted engineering degree	Semester 1
Year Two - Semester Two			
CIVL5268 **Structural Dynamics**	6	**A** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis.	Semester 2
CIVL9206 **Steel Structures 1**	6	**A** (CIVL9110 OR CIVL5501) AND (CIVL9201 OR CIVL5502) AND (CIVL9230 OR CIVL5509) AND (CIVL9235 OR CIVL5513) **N** CIVL5508 *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. A special "assumed knowledge" lecture will be given in Week 1 to refresh the knowledge of students.*	Semester 2
ENGG5205 **Professional Practice in PM**	6	*This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.*	Semester 1 Semester 2
Select 6 credit points from the Specialist electives block.			
Year Three - Semester One			
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5257 **Concrete Structures: Prestressed**	6		Semester 1
CIVL5267 **Steel Structures - Advanced Design**	6		Semester 1
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5020 and 6cp of recommended electives with CIVL5222 Dissertation A.			
Select 6 credit points from the Specialist electives block.			
Year Three - Semester Two			
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5264 **Composite Steel-Concrete Structures**	6		Semester 2
CIVL9903 **Civil Engineering Design**	6	**A** CIVL9410 AND CIVL9612 AND CIVL9811 **P** (CIVL9205 OR CIVL5507) AND (CIVL9206 OR CIVL5508) **N** CIVL5510	Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5021 and 6cp of recommended electives with CIVL5223 Dissertation B.			
Select 6 credit points from the Electives block.			
Specialist Elective units Candidates must complete 12 credit points from the following Specialist elective units of study.			
CIVL5266 **Steel Structures - Stability**	6	**A** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis.	Semester 1
CIVL5269 **Concrete Structures - Strength & Service**	6	**P** CIVL3205 OR CIVL5507 OR CIVL9205	Semester 2
CIVL5458 **Numerical Methods in Civil Engineering**	6		Semester 1
Elective units Candidates must complete 6 credit points from the following Elective units of study.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CHNG5005 **Wastewater Engineering**	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 1
CIVL5450 **Analysis and Design of Pile Foundations**	6		Semester 1
CIVL5451 **Computer Methods in Geotechnical Eng** *This unit of study is not available in 2015*	6		Semester 1
CIVL5453 **Geotechnical Hazards**	6	**A** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity).	Semester 2
CIVL5454 **Rock Engineering**	6	**A** Undergraduate geology and soil mechanics	Semester 2
CIVL5455 **Engineering Behaviour of Soils**	6	**A** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential.	Semester 2
CIVL5666 **Open Channel Flow & Hydraulic Structures**	6	**A** Advanced knowledge of fluid mechanics is necessary for this UoS.	Semester 1
CIVL5668 **Wind Engineering for Design-Fundamentals**	6		Semester 1
CIVL5669 **Applied Fluid Engineering Computing**	6	**A** CIVL5511 or CIVL9612. 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

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.

Extended Capstone Project candidates take Capstone Project units CIVL5020 and CIVL5022 (total 18 cp) in place of Capstone Project CIVL5021 and 6 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
CIVL5021 **Capstone Project B**	6	**C** CIVL5020	Semester 1 Semester 2
CIVL5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. *Note: Department permission required for enrolment*	Semester 1 Semester 2

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.

Research pathway candidates take Dissertation units CIVL5222 and CIVL5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
CIVL5222 **Dissertation A**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
CIVL5223 **Dissertation B**	12	**N** ENGG5220, ENGG5221 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Structural)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

CIVL9110
Materials

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 3 hours per week; Tutorial: 2 hours per week; Laboratory: 2 hours per semester. **Prohibitions:** CIVL5501 **Assumed knowledge:** This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. **Assessment:** Through semester assessment (60%), Final Exam (40%) **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.

CIVL9201
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:** CIVL5502 **Assumed knowledge:** From Engineering Mechanics, 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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

CIVL9810
Engineering Construction and 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. **Prohibitions:** CIVL5506 **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This UoS includes a 2 day Engineering Construction and Survey Camp where field survey is practised and exercises in the application of field survey to Engineering Construction are also undertaken. The Camp is held 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)

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.

ENGG9802
Engineering Mechanics

Credit points: 6 **Session:** Semester 2, Summer Main **Classes:** 2 hrs Lectures per week, 3hrs tutorial per week **Prohibitions:** ENGG5802 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to provide students with an understanding of and competence in solving statics and introductory dynamics 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. Introduction to kinematics and dynamics topics includes position, velocity and acceleration of a point; relative motion, force and acceleration, momentum, collisions and energy methods.

Year One - Semester Two

CIVL9230
Structural Concepts and Design

Credit points: 6 **Session:** Semester 2 **Classes:** 4 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** CIVL5509 **Assumed knowledge:** Structural mechanics, first year mathematics, but these are not prerequisites **Assessment:** Through semester assessment (25%), Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Basic structural elements include beams, columns slabs and simple frames

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.

CIVL9410
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:** CIVL5504 **Assumed knowledge:** CIVL9201 OR CIVL5502. An understanding of simple statics, equilibrium, forces and bending moments, and of stress and strain and the relationship between them. This is covered by University of Sydney courses ENGG9802 Engineering Mechanics, CIVL9201 Structural Mechanics. Familiarity with the use of spreadsheets (Excel, Mathcad) to obtain solutions to engineering problems, and with the graphical presentation of this data. Familiarity with word processing packages for report presentation. Some of this is covered in the University of Sydney course ENGG9801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.

CIVL9611
Introductory Fluid Mechanics

Credit points: 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. 1 hour of laboratory work per semester. **Prohibitions:** CIVL5505 **Assumed knowledge:** CIVL5502 OR CIVL9201. 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 their analytical and numerical solutions **Assessment:** Through semester assessment (50%), Final Exam (50%) **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 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.

GEOL1501
Engineering Geology 1

Credit points: 6 **Teacher/Coordinator:** A/Prof Tom Hubble **Session:** Semester 2 **Classes:** Two 2 hour lectures per week and 24 hours laboratory classes. **Prohibitions:** GEOS1903, GEOL1902, GEOS1003, GEOL1002 **Assumed knowledge:** No previous knowledge of Geology assumed **Assessment:** Practical laboratory work, Assignments, Tests and Quizzes, and a combined theory and practical exam (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Course objectives: To introduce basic geology and the principles of site investigation to civil engineering students. Expected outcomes: Students should develop an appreciation of geologic processes and their influence civil engineering works, acquire knowledge of the most important rocks and minerals and be able to identify them, and interpret geological maps with an emphasis on making construction decisions. Syllabus summary: Geological concepts relevant to civil engineering and the building environment. Introduction to minerals; igneous, sedimentary and metamorphic rocks, their occurrence, formation and significance. General introduction to physical geology and geomorphology, structural geology, plate tectonics, hydrogeology, rock core logging site investigation techniques for construction. Associated laboratory work on minerals, rocks and mapping.

Textbooks

Portrait of A Planet by Stephen Marshak, Published by H.H. Norton and Company and readings provided via Blackboard

Year Two - Semester One

CIVL9205
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. **Prohibitions:** CIVL5507 **Assumed knowledge:** (CIVL5501 OR CIVL9110) AND (CIVL5502 OR CIVL9201) AND (CIVL5509 OR CIVL9230). basic concepts of solid mechanics and structural mechanics, including: compatability of strains; stress-strain relationships; equilibrium; flexure, shear and torsion; statically determinate load effects (reactions, bending moments, shear forces); elastic beam theory (strains, stresses and beam deflections). **Assessment:** Through semester assessment (60%), Final Exam (40%) **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.

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.

CIVL9612
Fluid Mechanics

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2hrs per week, Tutorial 2hrs per week, Laboratory 4.5 hrs per semester. **Prohibitions:** CIVL5511 **Assumed knowledge:** (CIVL9201 OR CIVL5502) AND (CIVL9611 OR CIVL5505) AND (ENGG9802 OR ENGG5802). This unit of study follows on from Fluid Mechanics CIVL9611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. **Assessment:** Through semester assessemnt (60%), Final Exam (40%) **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.

CIVL9811
Engineering Design and Construction

Credit points: 6 **Session:** Semester 1 **Classes:** Workshop 3 hours per week. Lecture/Presentation 2 hrs per week, **Prohibitions:** CIVL5512 **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. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This unit aims to prepare students for employment in a broad range of engineering areas including design, planning and construction management.

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 CIVL9810 (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; timber engineeering; post-tensioned/prestressed concrete construction; civil engineering in a marine environment; insurance in the construction industry; occupational health and safety issues in the construction industry.

On day 1 of the course, a form based survey is taken to invite students to nominate specific areas of interest which may lead to adjustment in course content.

ENGG5204
Engineering Professional Practice

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Competences and experience in engineering obtained during an accepted engineering degree **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This UoS is designed to provide graduate engineers studying for a Master of Professional Engineering degree 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, basic knowledge of the law of contracts and legal responsibility, 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.

Year Two - Semester Two

CIVL5268
Structural Dynamics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students are assumed to have a good knowledge of fundamental structural analysis, which is covered in the courses of Structural Mechanics, Introduction to Structural Concepts and Design, Structural Analysis, and Finite Element Analysis. **Assessment:** Through semester assessment (65%) Final Exam (35%) **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 (SDOF) 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 Parts4 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

* Ability to apply AS1170 Part 4 in structural design against earthquake actions

* Understanding of the fundamental concepts of earthquake engineering

CIVL9206
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. **Prohibitions:** CIVL5508 **Assumed knowledge:** (CIVL9110 OR CIVL5501) AND (CIVL9201 OR CIVL5502) AND (CIVL9230 OR CIVL5509) AND (CIVL9235 OR CIVL5513) **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: 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. A special "assumed knowledge" lecture will be given in Week 1 to refresh the knowledge of students.

Students should refer to the printed version of the unit outline distributed in lecture 1.

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.

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hrs/week; E-Learning 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.

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 expertis.

Select 6 credit points from the Specialist electives block.

Year Three - Semester One

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5257
Concrete Structures: Prestressed

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - in class 1 hr/week; Project Work - own time 3 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

CIVL5267
Steel Structures - Advanced Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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 as well as international standards, 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, AS/NZS4600, AISC-LRFD, BS5950 and GB50017 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.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5020 and 6cp of recommended electives with CIVL5222 Dissertation A.

Select 6 credit points from the Specialist electives block.

Year Three - Semester Two

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5264
Composite Steel-Concrete Structures

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Students will understand the basic principles for the design of composite steel-concrete structures. In particular, they will develop an understanding of the procedures required for the design of composite beams, slabs and columns. Design guidelines will reflect requirements of the Australian Standards and international codes.

CIVL9903
Civil Engineering Design

Credit points: 6 **Session:** Semester 2 **Classes:** 1 hour of lectures and 3 hours of tutorials per week. **Prerequisites:** (CIVL9205 OR CIVL5507) AND (CIVL9206 OR CIVL5508) **Prohibitions:** CIVL5510 **Assumed knowledge:** CIVL9410 AND CIVL9612 AND CIVL9811 **Assessment:** Through semester assessment (75%), Final Exam (25%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace CIVL5021 and 6cp of recommended electives with CIVL5223 Dissertation B.

Select 6 credit points from the Electives block.

Specialist Elective units

Candidates must complete 12 credit points from the following Specialist elective units of study.

CIVL5266
Steel Structures - Stability

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in Structural Mechanics, Steel Structures, and Structural Analysis. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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.

CIVL5269
Concrete Structures - Strength & Service

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Laboratory 2 hrs/week. **Prerequisites:** CIVL3205 OR CIVL5507 OR CIVL9205 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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). Strut-and-tie modelling of reinforced concrete members is also described. Design guidelines will reflect requirements of the Australian Standards and Eurocodes.

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;

- ability to use strut-and-tie models of reinforced concrete behaviour.

CIVL5458
Numerical Methods in Civil Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives:

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.

Elective units

Candidates must complete 6 credit points from the following Elective units of study.

CHNG5005
Wastewater Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Group assignment 2 hrs/week; Site Visit 5 hrs/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. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit aims to acquaint students with the application of chemical engineering concepts and practice in an environmental context, the important example of wastewater treatment will be explored.

The key issues that will be considered are: Wastewater creation and characterisation; Wastewater treatment costs; Primary, secondary and tertiary treatment options; High-rate anaerobic and aerobic treatment options; Sludge management and water recovery/reuse options; Process integration considerations.

By the end of this UOS, a student should have gained an engineering-based appreciation of the technical, economic and social challenges posed by wastewater generation and its cost-effective treatment.

This UoS is an advanced elective in chemical engineering. The concepts and enabling technologies taught here are relevant to the real-world practice of chemical engineering across a broad range of industries.

CIVL5450
Analysis and Design of Pile Foundations

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week; Project Work - own time 6 hrs/week; Laboratory 3 hrs/week. **Assessment:** Through semester assessment (100%) **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.

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

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (100%) **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.

CIVL5453
Geotechnical Hazards

Credit points: 6 **Teacher/Coordinator:** Pierre Rognon **Session:** Semester 2 **Classes:** Lecture: 3 hours per week; Tutorial: 1 hour per week. **Assumed knowledge:** CIVL2410 AND CIVL3411. Students are assumed to have a good knowledge of fundamental soil mechanics, which is covered in the courses of soil mechanics (settlement, water flow, soil strength) and foundation engineering (soil models, stability analyses; slope stability; retaining walls; foundation capacity). **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Geotechnical flows include landslides, rock falls and mud flows. They are triggered by soil failure due to natural or human causes. The objective of this Unit of Study is to develop the ability to assess and mitigate the risks associated to such events. Students will learn how to estimate when and where these events are likely to occur, how to define safety zones and how to design effective protection structures. The syllabus is comprised of (i) Landslide Risk Assessment and Management procedures (ii) post-faillure and out of equilibrium soil mechanics applied to prediction of rock fall, landslide and mud flow run-out distance and impact force on structures; (iii) design of geotechnical protection structures.

CIVL5454
Rock Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Laboratory 3 hrs/week. **Assumed knowledge:** Undergraduate geology and soil mechanics **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Objectives: to develop an understanding of the behaviour and design of engineering structures in rock masses

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.

CIVL5455
Engineering Behaviour of Soils

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 3 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical practice in estimating parameters from field and laboratory data would be useful but not essential. **Assessment:** Through semester assessment (100%) **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.

CIVL5666
Open Channel Flow & Hydraulic Structures

Credit points: 6 **Session:** Semester 1 **Assumed knowledge:** Advanced knowledge of fluid mechanics is necessary for this UoS. **Assessment:** Through semester assessment (100%) **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.

CIVL5668
Wind Engineering for Design-Fundamentals

Credit points: 6 **Session:** Semester 1 **Assessment:** Through semester assessment (60%) Final Exam (40%) **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, dynamic response of structures, and how all the above relates to AS1170.2.

CIVL5669
Applied Fluid Engineering Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Laboratory 2 hrs/week. **Assumed knowledge:** CIVL5511 or CIVL9612. 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. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The objective of this unit is to provide students with advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving thermal fluid 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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units CIVL5020 and CIVL5022 (total 18 cp) in place of Capstone Project CIVL5021 and 6 cp of elective units.

CIVL5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Research 10 hrs/week; Meeting, **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must precede CIVL5021 Capstone Project B, should cover the first half of the work required for a complete Capstone 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.

CIVL5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Corequisites:** CIVL5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Capstone Project provides an opportunity for students to conduct original research. Students will generally work individually and an individual thesis must be submitted by each student.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021). This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

CIVL5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 10 hrs/week; Meeting, **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

Capstone Project 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 Capstone Project course coordinator and the relevant academic supervisor concerned will a student be permitted to undertake a project individually.

Capstone Project 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, Capstone Project A (CIVL5020) and Capstone Project B (CIVL5021) or this unit Capstone Project B extended (CIVL5022) worth 12 credit points. This particular unit of study, which must be preceded by or be conducted concurrently with CIVL5020 Capstone Project A, should cover the second half of the work required for a complete Capstone Project. In particular, it should include completion of all components of the research or investigation project planned but not undertaken or completed in CIVL5020 Capstone Project A.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units CIVL5222 and CIVL5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

CIVL5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

CIVL5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5220, ENGG5221 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution.The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution.The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Telecommunications Engineering

Course overview

A postgraduate specialisation in Telecommunications Engineering will provide you with advanced skills in the design, build and management of systems that carry out the transmission and broadcasting of information using wireless signals.

Areas of study include radio frequency engineering, mobile networks, gigabits wireless systems, and satellite communication systems.

This degree has been given full accreditation at the level of Professional Engineering by the industry governing body, Engineers Australia.

Course requirements

Candidates for the Master of Professional Engineering (Telecommunications Engineering) complete 144 credit points as listed in the unit of study table.

Candidates also complete 12 weeks of practical experience.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Professional Engineering (Telecommunications)			
To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.			
Core units			
Year One			
Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.			
Year One - Semester One			
COMP9129 **Software Construction**	6	**A** Some prior knowledge of programming is preferred; for students without programming experience, extra assistance is given in the first 6 weeks of the semester. **N** COMP5212	Semester 1
ELEC9602 **Digital Logic**	6	**A** This unit of study assumes some knowledge of digital data representation and basic computer organisation. **N** ELEC5722	Semester 1
ELEC9703 **Fundamentals of Elec and Electronic Eng**	6	**A** Basic knowledge of differentiation & integration, and HSC Physics **N** ELEC5710	Semester 1
ENGG5011 **Foundation Engineering Studies A**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Main
Year One - Semester Two			
ELEC9103 **Simulations and Numerical Solutions in Eng**	6	**A** ELEC9703. Understanding of the fundamental concepts and building blocks of electrical and electronics circuits and aspects of professional project management, teamwork, and ethics. **N** : ELEC5723 OR ELEC2103 OR COSC1001 OR COSC1901	Semester 2
ELEC9302 **Signals and Systems**	6	**A** Basic knowledge of differentiation & integration, differential equations, and linear algebra. **N** ELEC5721	Semester 2
ELEC9601 **Computer Systems**	6	**A** HSC Mathematics extension 1 or 2 **N** ELEC5711	Semester 2
ELEC9704 **Electronic Devices and Circuits**	6	**A** 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. **N** : ELEC5720 OR ELEC2104	Semester 2
Year Two - Semester One			
ELEC9305 **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** ELEC5736	Semester 1
ELEC9505 **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** ELEC5739	Semester 1
ELEC9515 **Digital Communication Systems**	6	**N** ELEC5744	Semester 1
ENGG5202 **Sustainable Design, Eng and Mgt**	6	**A** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics	Semester 1
Year Two - Semester Two			
ELEC9506 **Data Communications and the Internet**	6	**N** ELEC5740	Semester 2
Select 18 credit points from the Specialist Electives unit block.			
Year Three - Semester One			
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ENGG5204 **Engineering Professional Practice**	6	**A** Competences and experience in engineering obtained during an accepted engineering degree	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5217 **Practical Experience**		*Students should have completed one year of their MPE program before enrolling in this unit.*	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5020 and 6cp of recommended electives with ELEC5222 Dissertation A.			
Select 6 credit points from the Specialist Electives unit block.			
Select 6 credit points from the Management Electives unit block.			
Year Three - Semester Two			
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units. Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5021 and 6cp of recommended electives with ELEC5223 Dissertation B.			
Select 12 credit points from the Specialist Electives unit block.			
Select 6 credit points from the Management Electives unit block.			
Specialist Elective units Candidates must complete 36 credit points from the following table of Specialist Elective units of study.			
ELEC5101 **Antennas and Propagation**	6		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.	Semester 1
ELEC5507 **Error Control Coding**	6	**A** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired.	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
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.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	Semester 2
ELEC5514 **Networked Embedded Systems**	6	**A** ELEC3305, ELEC3506, ELEC3607 and ELEC5508	Semester 2
ELEC5516 **Electrical and Optical Sensor Design**	6	**A** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis	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) **N** MECH5701	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
Management Elective units Candidates must complete 12 credit points from the following Management Elective units of study.			
ENGG5203 **Quality Engineering and Management**	6	**A** First degree in Engineering or a related discipline	Semester 2
ENGG5205 **Professional Practice in PM**	6	*This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.*	Semester 1 Semester 2
ENGG5214 **Management of Technology**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
ENGG5215 **International Eng Strategy & Operations**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 2
ENGG5216 **Management of Engineering Innovation**	6	**A** Sound competence in all aspects of engineering, and some understanding of issues of engineering management	Semester 1
Project units All candidates are required to complete a minimum of 12 credit points of Project units. Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Extended Capstone Project candidates take Capstone Project units ELEC5020 and ELEC5022 (total 18 cp) in place of Capstone Project ELEC5021 and 6 cp of elective units.			
ELEC5020 **Capstone Project A**	6	**P** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study)	Semester 1 Semester 2
ELEC5021 **Capstone Project B**	6	**C** ELEC5020	Semester 1 Semester 2
ELEC5022 **Capstone Project B Extended**	12	**P** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption *Note: Department permission required for enrolment*	Semester 1 Semester 2
Research pathway			
Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway. Research pathway candidates take Dissertation units Research pathway students take Dissertation units ELEC5222 and ELEC5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.			
ELEC5222 **Dissertation A**	12	**N** ENGG5222, ELEC8902, ENGG5223, ELEC8901 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
ELEC5223 **Dissertation B**	12	**N** ELEC8901, ELEC8902, ENGG5223, ENGG5222 *Note: Department permission required for enrolment* *In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.*	Semester 1 Semester 2
Exchange units			
Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.			
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Professional Engineering (Telecommunications)

To qualify for the award of the Master of Professional Engineering in this specialisation, a candidate must complete 144 credit points, including core and elective units of study as listed below. Candidates with a Bachelor of Engineering or equivalent in the relevant discipline, and who have reached an acceptable level of academic achievement in their prior degree, may be eligible for a reduction of volume in learning of up to 48 credit points.

Core units

Year One

Year One covers Foundation units only. Candidates with a prior Bachelor of Engineering degree or equivalent in the field related to this specialisation may be exempted from Foundation units.

Year One - Semester One

COMP9129
Software Construction

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 2 hours per week; Laboratory: 1 hours per week **Prohibitions:** COMP5212 **Assumed knowledge:** Some prior knowledge of programming is preferred; for students without programming experience, extra assistance is given in the first 6 weeks of the semester. **Assessment:** Through semester assessments (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is a programming unit of study that is designed to enable students, coming from any background, to learn to program in the C language, with emphasis on the individual producing code that works correctly. as a gentler start to C itself, the unit starts with Python, introducing the same core ideas. Once students have mastered this, we move to C, tackling the same deep ideas in the context of the much more difficult programming in C.

Topics include: 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.

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.

ELEC9602
Digital Logic

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures, 2 hours of tutorials and 3 hours of laboratory work per week. **Prohibitions:** ELEC5722 **Assumed knowledge:** This unit of study assumes some knowledge of digital data representation and basic computer organisation. **Assessment:** Through semester assessment (30%), Final Exam (70%) **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.

ELEC9703
Fundamentals of Elec and Electronic Eng

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture: 3 hours per week; Laboratory: 3 hours per week; Tutorial: 2 hours per week **Prohibitions:** ELEC5710 **Assumed knowledge:** Basic knowledge of differentiation & integration, and HSC Physics **Assessment:** Through semester assessment (40%), Final Exam (60%) **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

ENGG5011
Foundation Engineering Studies A

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Main **Classes:** Project Work - own time 8 hrs. **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

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.

Year One - Semester Two

ELEC9103
Simulations and Numerical Solutions in Eng

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hours per week, Laboratory 3 hours per week. **Prohibitions:** : ELEC5723 OR ELEC2103 OR COSC1001 OR COSC1901 **Assumed knowledge:** ELEC9703. Understanding of the fundamental concepts and building blocks of electrical and electronics circuits and aspects of professional project management, teamwork, and ethics. **Assessment:** Through semester assesment (25%), Final Exam (75%) **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.

ELEC9302
Signals and Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 1 hours per week; Laboratory: 2 hours per week; Tutorial: 2 hours per week; E-Learning: 1 hours per week **Prohibitions:** ELEC5721 **Assumed knowledge:** Basic knowledge of differentiation & integration, differential equations, and linear algebra. **Assessment:** Through semester assessment (30%), Final Exam (70%) **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.

ELEC9601
Computer Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 3 hours per week; Tutorial: 2 hours per week **Prohibitions:** ELEC5711 **Assumed knowledge:** HSC Mathematics extension 1 or 2 **Assessment:** Through semesteer assessment (59%), Final Exam (41%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study introduces the fundamental digital concepts upon which the design and operation of modern digital computers are based. A prime aim of the unit is to develop a professional view of, and a capacity for inquiry into, the field of computing.

Topics covered include: data representation, basic computer organisation, the CPU, elementary gates and logic, peripheral devices, software organisation, machine language, assembly language, operating systems, data communications and computer networks.

ELEC9704
Electronic Devices 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:** : ELEC5720 OR ELEC2104 **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. **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 ELEC9703 is assumed.

Year Two - Semester One

ELEC9305
Digital Signal Processing

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours lab/tutorial per week. **Prohibitions:** ELEC5736 **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. **Assessment:** Through semester assessment (43%), Final Exam (57%) **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.

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

ELEC9505
Communications

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 3 hours lab and tutorial per week. **Prohibitions:** ELEC5739 **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. **Assessment:** Through semester assessment (45%), Final Exam (55%) **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.

ELEC9515
Digital Communication Systems

Credit points: 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and a 2 hours lab/tutorial per week. **Prohibitions:** ELEC5744 **Assessment:** Through semester assessment (45%), Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The lecture starts with an overview of major components of a digital communication system and current technology. Then the following knowledge will be covered: efficient coding/representation of information source, channel coding of information to combat noise and interference, optimal received design, principles of incoherent systems, error probability calculations, solutions to problems caused by transmitting a signal through a bandlimited channel and caused by multipath, and spread spectrum systems. The lecture concludes with a discussion of future directions of digital communication systems.

ENGG5202
Sustainable Design, Eng and Mgt

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The aim of this UoS is to give students an insight and understanding of the environmental and sustainability challenges that Australia and the planet are facing and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy and water, and how engineering is addressing these challenges.

The course starts with a description of the physical basis of global warming, and proceeds with a discussion of Australia`s energy and water use, an overview of sustainable energy and water technologies and sustainable building design. Topics include the principles of sustainability, sustainable design and social responsibility, sustainable and renewable energy sources, and sustainable use of water. Aspects of designing a sustainable building, technologies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

Year Two - Semester Two

ELEC9506
Data Communications and 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:** ELEC5740 **Assessment:** Through semester assessment (50%), Final Exam (50%) **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.).

Select 18 credit points from the Specialist Electives unit block.

Year Three - Semester One

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ENGG5204
Engineering Professional Practice

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Competences and experience in engineering obtained during an accepted engineering degree **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This UoS is designed to provide graduate engineers studying for a Master of Professional Engineering degree 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, basic knowledge of the law of contracts and legal responsibility, 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.

ENGG5217
Practical Experience

Session: Semester 1, Semester 2 **Classes:** Practical Experience, **Assessment:** Through semester assessment (100%) **Mode of delivery:** Professional practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

The 3 year 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 the final year of the MPE program (Year 3). 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 http://sydney.edu.au/engineering/practical-experience/index.shtml

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5020 and 6cp of recommended electives with ELEC5222 Dissertation A.

Select 6 credit points from the Specialist Electives unit block.

Select 6 credit points from the Management Electives unit block.

Year Three - Semester Two

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project. See Project units.Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway and may replace ELEC5021 and 6cp of recommended electives with ELEC5223 Dissertation B.

Select 12 credit points from the Specialist Electives unit block.

Select 6 credit points from the Management Electives unit block.

Specialist Elective units

Candidates must complete 36 credit points from the following table of Specialist Elective units of study.

ELEC5101
Antennas and Propagation

Credit points: 6 **Session:** Semester 2 **Classes:** Laboratory 3 hrs/week; Lecture 2 hrs/week; Independent Study, **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The basics of antenna radiation are introduced with emphasis on the important performance characteristics of the radiation field pattern (in 3 dimensions) and feed impedance. The omnidirectional and Hertzian dipole antennas (both hypothetical in practise but robust theoretically) provide the starting point to analyse real antenna operation. Mutual coupling between close antennas and important 'ground' imaging effects lead to the design of antenna arrays to increase gain and directivity. Aperture antennas and frequency broadbanding techniques are introduced. Ionospheric propagation is discussed and also the the reception efficiency of receiving antennas which allows consideration of a Transmitter - Receiver 'Link budget'. The important 'Pocklington' equation for a wire dipole is developed from Maxwell's equations and leads to the numerical analysis of wire antennas using 'Moment' methods. Real world applications are emphasised throughout and are reinforced by the hands on laboratory program which includes design projects.

ELEC5403
Radio Frequency Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Tutorial 2 hrs/week; Lecture 2 hrs/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assumed knowledge:** ELEC3305, ELEC3506, ELEC3607 and ELEC5508 **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit aim to teach the fundamentals concepts associated with:

oNetworked Embedded Systems, wireless sensor networks

oWireless channel propagation and radio power consumption

oWireless networks, ZigBee, Bluetooth, etc.

oSensor principle, data fusion, source detection and identification

oMultiple source detection, multiple access communications.

oNetwork topology, routing, network information theory

oDistributed source channel coding for sensor networks

oPower-aware and energy-aware communication protocols.

oDistributed embedded systems problems such as time synchronization and node localization,

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.

oAbility to identify the main issues and trade-offs in networked embedded systems.

oUnderstanding of the state-of-the-art solutions in the area

oBased on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.

oFamiliarization with a simulator platform and real hardware platforms for network embedded systems through the students involvement in project

ELEC5516
Electrical and Optical Sensor Design

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hours per week; Tutorial 1 hour per week; E-Learning 1 hour per week; Laboratory: 8 hours overall. **Assumed knowledge:** Math Ext 1, fundamental concepts of signal and systems, fundamental electrical circuit theory and analysis **Assessment:** Through semester assessment (40%), Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The course focuses on environmentally friendly, intelligent sensors for multiple parameters monitoring to be used in power network and broadband network. The concepts learnt in this unit will be heavily used in various engineering applications in power systems, fiber optic systems and health monitoring. These concepts include:

-Theory, design and applications of optical fiber sensors.

-Sensor technologies for the growth of smart grid in power engineering.
-Actuators and motors for electrical sensor and its applications.

-Wearable sensor technologies for ehealth monitoring.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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.

Management Elective units

Candidates must complete 12 credit points from the following Management Elective units of study.

ENGG5203
Quality Engineering and Management

Credit points: 6 **Session:** Semester 2 **Classes:** Presentation 2 hrs/week; Project Work - in class 2 hrs/week; Project Work - own time 6 hrs. **Assumed knowledge:** First degree in Engineering or a related discipline **Assessment:** Through semester assessment (100%) **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 control and management as well as systems assurance processes. 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.

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hrs/week; E-Learning 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.

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 expertis.

ENGG5214
Management of Technology

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 1 hr/week; Tutorial 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Uos is designed to develop competence in the management of technology. It will address all aspects of the management of technology, the nature and importance of technological change and innovation, within the context of the global knowledge economy, the management of the new product development process, the role of technology in manufacturing and service competitiveness, the role of IT in logistics management, supply chain strategies, and communication, and the characteristics of high technology markets.

ENGG5215
International Eng Strategy & Operations

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week; Project Work - in class 2 hr/week for half the semester. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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 1 hr/week; Tutorial 1 hr/week; Presentation 1 hr/week; Project Work - in class 2 hrs/week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management **Assessment:** Through semester assessment (100%) **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.

Project units

All candidates are required to complete a minimum of 12 credit points of Project units.Candidates achieving an average mark of 70% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Extended Capstone Project.Extended Capstone Project candidates take Capstone Project units ELEC5020 and ELEC5022 (total 18 cp) in place of Capstone Project ELEC5021 and 6 cp of elective units.

ELEC5020
Capstone Project A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 96 cp from MPE degree program or 24 cp from the ME program (including any credit for previous study) **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5021
Capstone Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Corequisites:** ELEC5020 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

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.

ELEC5022
Capstone Project B Extended

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 12 hrs. **Prerequisites:** 42 credit points in the Master of Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The Capstone Project 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. Capstone Project is undertaken across two semesters of enrolment, in two successive Units of Study of 6 credits points each. Capstone Project A covers first steps of thesis research starting with development of research proposal. Capstone Project B covers the second of stage writing up and presenting the research results, and Capstone Project B extended allows the student to investigate a topic of greater depth and scope.

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.

Research pathway

Candidates achieving an average mark of 75% or higher over 48 credit points of units of study in the Year Two Table or equivalent are eligible for the Research Pathway.Research pathway candidates take Dissertation units Research pathway students take Dissertation units ELEC5222 and ELEC5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

ELEC5222
Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ENGG5222, ELEC8902, ENGG5223, ELEC8901 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

ELEC5223
Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Prohibitions:** ELEC8901, ELEC8902, ENGG5223, ENGG5222 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: In order to enrol in a project, students must first secure an academic supervisor in an area that they are interested. The topic of your project must be determined in discussion with the supervisor. The supervisor can come from any of the Engineering Departments, however, they need to send confirmation of their supervision approval to the Postgraduate Administrator.

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 sessions 1 & 2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may taken in place of other units, towards the requirements ofthe degree.

ENGG5231
Engineering Graduate Exchange A

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

ENGG5232
Engineering Graduate Exchange B

Credit points: 6 **Session:** Intensive January, Intensive July **Mode of delivery:** Normal (lecture/lab/tutorial) day

The purpose of this unit is to enable students to undertake an overseas learning activity during the university's summer or winter break while completing a Masters degree in either Engineering, Professional Engineering, Information Technologies or Project Management. The learning activity may comprise either a short project under academic or industry supervision or summer or winter school unit of study at an approved overseas institution. The learning activity should demonstrate outcomes and workload equivalent to a 6 credit point Master's level unit in the student's current award program.

Students may enrol in this unit with permission from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

For more information on units of study visit CUSP.

Information Technology and Information Technology Management

The School of Information Technologies offers four distinct postgraduate coursework programs for specific stages in your professional career. They are the:

- Graduate Diploma in Computing
- Master of Health Technology Innovation
- Master of Information Technology
- Master of Information Technology Management.

Graduate Diploma in Computing

The Graduate Diploma in Computing is designed for people with a non-IT background who want to acquire computing skills to move into the IT industry.

Master of Information Technology

The Master of Information Technology program is designed for IT professionals who want to update their skills or acquire expertise in a new area of IT.

Master of Information Technology Management

The Master of Information Technology Management program is designed for technically-skilled graduates wanting to transition into management.

It helps develop important non-technical skills such as project management, team communication and analytical thinking.

Master of Health Technology Innovation

Course overview

The Master of Health Technology Innovation, offered by the School of Information Technologies and the Charles Perkins Centre, is a unique cross-disciplinary program that fosters further learning and application of technological innovations in the area of health and medical sciences.

The cross-disciplinary nature of Health Technology Innovation is applicable to engineering and information technology, the health, medical, and social sciences, and highly suitable for technology professionals who are pursuing a pioneering path to become leaders in health technology and industry practice.

More information about units of study and degree program requirements can be found onCUSP.

Please note that places in the Health Technology Innovation postgraduate courses will be available from Semester 2 2015.

Health Technology Innovation

Graduate Diploma in Health Technology Innovation

Master of Health Technology Innovation

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 2010 (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
HF042	Graduate Diploma in Health Technology Innovation
HC049	Master of Health Technology Innovation

2 Attendance pattern

The attendance pattern for these courses is full time or part time according to the candidate's 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 Diploma in Health Technology Innovation
(b) the Master of Health Technology Innovation
(2) Providing candidates satisfy the admission requirements for each stage, a candidate may progress to theaward of any of the courses in this sequence. Only the highest award completed will be conferred.

5 Cross-faculty management

(1) The Faculty of Engineering & IT is the administering faculty for the course. Candidates in this degree program will be under the general supervision of Faculty of Engineering and Information Technologies.
(2) The Director of Education Program Development, Charles Perkins Centre, exercises authority in any matter concerned with the cross-faculty course not otherwise dealt with in these resolutions, in consultation with the Deans of the participating faculties.

6 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 Master of Health Technology Innovation requires:
(a) a minimum of a bachelor's degree from the University of Sydney or qualifications deemed by the faculty to be equivalent, with a minimum credit average; or
(b) completion of the requirements of the embedded graduate diploma, with a minimum credit average.
(3) Admission to the Graduate Diploma in Health Technology Innovation requires:
(a) A minimum of a bachelor's degree from the University of Sydney, or qualifications deemed by the faculty to be equivalent.
(4) In exceptional circumstances the Dean or nominee 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.

7 Requirements for award

(1) The units of study that may be taken for the course/s are set out in the table of units of study for the Master of Health Technology Innovation.
(2) To qualify for the award of the Graduate Diploma in Health Technology Innovation a candidate must complete 60 credit points including:
(a) a minimum of 12 credit points of the Core units of study; and
(b) a minimum of 12 credit points of the Specialist units of study; and
(c) a maximum of 12 credit points of the Foundation units of study. Candidates will be required to select units which complement their prior background and qualifications (subject to assessment by the Academic Director).
(3) To qualify for the award of the Master of Health Technology Innovation a candidate must complete 96 credit points including:
(a) 24 credit points of the Core units of study; and
(b) a minimum of 24 credit points of the Specialist units of study; and
(c) a minimum of 12 credit points of the Project units of study; and
(d) a maximum of 24 credit points of the Foundation units of study. Candidates will be required to select units which complement their prior background and qualifications (subject to assessment by the Academic Director).
(4) If a reduction in the volume of learning is given then the candidate is able to apply for an exemption for some course requirements, if evidence can be provided of prior learning (subject to assessment by the Academic Director):
(a) Candidates will be required to apply any reduced volume of learning awarded to the Foundation or Specialist units of study based on their prior background and qualifications.
(b) The candidate will then be required to complete the required volume of learning based on the remaining course requirements.

8 Progression Rules

(1) A candidate for the Master of Health Technology Innovation must complete 24 credit points from Core, Specialist or Foundation units of study before taking any Health Technology Innovation Capstone Project units. Candidates who do not achieve a Credit average may have their eligibility for the Capstone Project subject to review by the Academic Director.

(2) With permission from the Dean or nominee, a candidate for the Master of Health Technology Innovation who completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take Health Technology Innovation Dissertation Project units.

(3) Admission to the Project units of study is subject to availability of supervision and to the approval of the Academic Director.

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's degree 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 (for non-conferred qualifications only)

(1) The following Coursework Rules (for non-conferred qualifications) replace the Faculty Coursework Rules for "Credit for previous study" within the "Resolutions of the Faculty (of Engineering and Information Technologies)" for the Master of Health Technology Innovation:

(a) where postgraduate study has been undertaken at the University of Sydney in one of the embedded courses of the Master of Health Technology Innovation and no award has been conferred, credit may be transferred in full if the units of study are recognised as part of the Master of Health Technology Innovation (subject to credit limits in the table of units of study: Master of Health Technology Innovation), provided the study has been undertaken within the previous three years and subject to approval of the Academic Director. In addition, a credit transfer for the purposes of a course upgrade will require either:

(i) fulfilment of the admission requirements for the "Admission to Candidature" for the Master of Health Technology Innovation including at least a credit average from the prior qualification used for admission; or

(ii) completion of a minimum of 24 credit points of the currently enrolled course with at least a credit average;

(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 Master of Health Technology Innovation, provided:

(i) the study has been undertaken at the University of Sydney, or at an external institution recognised by the University of Sydney; 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) Credit will not be granted for recognised prior learning older than 10 years at the time of first enrolment.

13 Recognition of Prior Learning (for conferred qualifications only)

(1) The following Coursework Rules (for conferred qualifications) replace the Faculty Coursework Rules for "Credit for previous study" within the "Resolutions of the Faculty (of Engineering and Information Technologies)" for the Master of Health Technology Innovation and the Graduate Diploma in Health Technology Innovation:

(a) where study has been undertaken and an award has been conferred, candidates who are offered direct admission to the Master of Health Technology Innovation may be eligible for a reduction in the volume of learning of up to 48 credit points provided that study for the conferred award has been undertaken at an external institution recognised by the University of Sydney. Any recognition of prior learning is subject to the following guidelines and requires the approval of the Academic Director:

(i) the maximum permissible reduction in the volume of learning is 48 credit points for a Graduate Diploma (at level 8 of the Australian Qualifications Framework) including relevant studies in both health and technology fields.

(ii) the maximum permissible reduction in the volume of learning is 48 credit points for a Bachelor's degree with Honours (at level 8 of the Australian Qualifications Framework) including relevant studies in both health and technology fields.

(iii) the maximum permissible reduction in the volume of learning is 48 credit points for a Master's degree (at level 9 of the Australian Qualifications Framework) including relevant study in either a health or technology field.

(iv) the maximum permissible reduction in the volume of learning is 24 credit points for a Bachelor's degree (at level 7 of the Australian Qualifications Framework) including relevant studies in both health and technology fields.

(v) the maximum permissible reduction in the volume of learning is 24 credit points for a Graduate Diploma (at level 8 of the Australian Qualifications Framework) including relevant studies in either a health or technology field.

(vi) the maximum permissible reduction in the volume of learning is 24 credit points for a Bachelor's degree with Honours (at level 8 of the Australian Qualifications Framework) including relevant studies in either a health or technology field.

(vii) the maximum permissible reduction in the volume of learning is 12 credit points for a Graduate Certificate (at level 8 of the Australian Qualifications Framework) including relevant studies in either a health or technology field.

(viii) the maximum permissible reduction in the volume of learning is 12 credit points for a Bachelor's degree (at level 7 of the Australian Qualifications Framework) including relevant studies in either a health or technology field.

(b) Where study has been undertaken and an award has been conferred, candidates who are offered direct admission to the Graduate Diploma in Health Technology Innovation may be eligible for a reduction in the volume of learning of up to 12 credit points, provided that study for the conferred award has been undertaken at an institution recognised by the University of Sydney. Any recognition for prior learning is subject to the following guidelines and requires the approval of the Academic Director:

(i) the maximum permissible reduction in the volume of learning is 12 credit points for a Bachelor's degree (at level 7 of the Australian Qualifications Framework) including relevant studies in both health and technology fields.

(ii) the maximum permissible reduction in the volume of learning is 12 credit points for a Graduate Diploma (at level 8 of the Australian Qualifications Framework) including relevant studies in either a health or technology field.

(iii) the maximum permissible reduction in the volume of learning is 12 credit points for a Bachelor's degree with Honours (at level 8 of the Australian Qualifications Framework) including relevant studies in either a health or technology field.

14 Satisfactory progress

Progression is subject to the Coursework Rule. A candidate for the Master of Health Technology Innovation who has failed to meet these progression rules will be transferred to the Graduate Diploma in Health Technology Innovation, depending on the credit points successfully completed.

15 Time Limit

(1) A candidate for the Master of Health Technology Innovation shall complete the requirements for the award in a minimum of two semesters and a maximum of twelve semesters.

(2) A candidate for the Graduate Diploma in Health Technology Innovation shall complete the requirements for the award in a minimum enrolment of two semesters and a maximum of enrolment of ten semesters.

16 Transitional provisions

These resolutions apply to students who commenced their candidature after 1 January, 2015.

Unit of study table

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Master of Health Technology Innovation			
Core, Specialist, Project and Foundation units of study for the Master of Health Technology Innovation and Graduate Diploma in Health Technology Innovation are shown in the following tables. Candidates for the Master of Health Technology Innovation are required to complete 96 credit points from the units of study as follows: 1. a minimum of 24 credit points of the Core units of study 2. a minimum of 24 credit points of the Specialist units of study 3. a minimum of 12 credit points of the Project units of study 4. A maximum of 24 credit points of Foundation units of study. Candidates will be required to select units which complement their prior background and qualifications (subject to assessment by the Academic Director). Candidates for the Graduate Diploma in Health Technology Innovation are required to complete 60 credit points from the units of study as follows: 1. a minimum of 12 credit points of the Core units of study 2. a minimum of 12 credit points of the Specialist units of study 3. a maximum of 12 credit points of the Foundation units of study If a reduction in the volume of learning is given to candidates of the Graduate Diploma or the Master's degree, this is to be applied to Foundation or Specialist units of study related to your prior background and qualifications.			
Core Units			
Candidates for the Master of Health Technology Innovation must complete a minimum of 24 credit points from the listed Core units of study.			
HTIN5001 **Nature of Systems**	6	**A** The unit is aimed at graduates and researchers who are interested in developing skills in complex systems analysis. The unit is highly interdisciplinary and as such, there is no assumed prior knowledge or course prerequisites. However, students who will benefit most from the unit will be those who are open-minded and motivated to "think outside the box". The unit has been deliberately designed as a new teaching and learning experience.	Semester 1 Semester 2
HTIN5002 **Quality Frameworks for Health Innovation**	6		Semester 1 Semester 2
HTIN5003 **Health Technology Evaluation**	6		Semester 2
HTIN5004 **Integrated Approaches to Chronic Disease**	6		Semester 1 Semester 2
Specialist Units			
Candidates for the Master of Health Technology Innovation must complete a minimum of 24 credit points from the listed Specialist units of study.			
AMME5921 **Biomedical Engineering Tech 2**	6	**A** This is an introductory Masters of Engineering unit. A bachelors degree, ideally in the engineering or science field, is advisory, but not essential.	Semester 2
AMME9961 **Biomechanics and Biomaterials**	6	**A** Chemistry, Biology, Materials Engineering, and Engineering Design at least at the Junior level. **N** AMME5961	Semester 2
AMME9971 **Tissue Engineering**	6	**A** 6 credit points of junior biology, 6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent. **N** AMME5971 *The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of junior and intermediate biology and thus students will already have practical hands-on biological training. The purpose of this UoS is to elaborate the theory and latest developments of this very new field of tissue engineering, thereby building on the existing practical and theoretical knowledge base the students have in cell biology.*	Semester 1
BETH5102 **Philosophy of Medicine**	6	*If an insufficient number of students opt to attend seminars on campus, the co-ordinator may choose to teach this Unit of Study in online mode only. Students will be contacted if this occurs.*	Semester 1
BETH5202 **Human and Animal Research Ethics**	6	**N** BETH5208	Semester 2
BETH5203 **Ethics and Public Health**	6	**P** A three-year undergraduate degree in science; medicine; nursing; allied health sciences; philosophy/ethics; sociology/anthropology; history; or other relevant field; or by special permission. **N** BETH5206	Semester 2
CLTR5001 **Trial Design and Methods**	6		Semester 1
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1
COMP5424 **Information Technology in Biomedicine**	6		Semester 1
COMP5427 **Usability Engineering**	6		Semester 2
COMP5456 **Introduction to Bioinformatics** *This unit of study is not available in 2015*	6	**A** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **N** COMP3456	Summer Main
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2
INFO5306 **Enterprise Healthcare Info Systems**	6	**A** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS).	Semester 2
INFO5992 **Understanding IT Innovations**	6	**A** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **N** PMGT5875 *A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.*	Semester 1 Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.	Semester 1
NURS5070 **Creating a Culture of Safety and Quality**	6		Semester 2
PUBH5224 **Advanced Epidemiology**	6	**P** PUBH5010 or CEPI5100	Semester 2
PUBH5422 **Health and Risk Communication**	6		Semester 2
PUBH5500 **Advanced Qualitative Health Research**	6	**N** QUAL5005	Semester 1
Foundation Units			
Students may complete a maximum of 24 credit points of the Foundation units of study. Candidates will be required to select units which complement their prior background and qualifications (subject to assessment by the Academic Director).			
AMME5951 **Fundamentals of Neuromodulation**	6	**A** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent.	Semester 1
BETH5102 **Philosophy of Medicine**	6	*If an insufficient number of students opt to attend seminars on campus, the co-ordinator may choose to teach this Unit of Study in online mode only. Students will be contacted if this occurs.*	Semester 1
COMP5116 **Design of Networks & Distributed Systems**	6		Semester 2
COMP5206 **Information Technologies and Systems**	6		Semester 1 Semester 2
COMP9007 **Algorithms**	6	**A** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **N** COMP5211	Semester 2
COMP9103 **Software Development in Java**	6	**N** COMP5214	Semester 1 Semester 2
COMP9120 **Database Management Systems**	6	**A** Some exposure to programming and some familiarity with data model concepts **N** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content.	Semester 1 Semester 2
COMP9220 **Object-Oriented Design**	6	**A** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **N** : COMP5028 OR INFO3220	Semester 1
INFO9003 **IT for Health Professionals**	6	**N** INFO5003 *Note: Department permission required for enrolment*	Semester 2
PUBH5010 **Epidemiology Methods and Uses**	6	**N** BSTA5011	Semester 1
PUBH5018 **Introductory Biostatistics**	6		Semester 1
QUAL5002 **Qualitative Methodologies & Study Design**	6	**A** Basic understanding of the nature of qualitative knowledge and the processes of qualitative research. **C** PUBH5500 *Departmental permission is required for students who have not completed PUBH5500.*	Intensive May

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Project Units			
Candidates for the Master of Health Technology Innovation must complete a minimum of 12 credit points of Project units of study.			
HTIN6010 Health Technology Innovation Capstone	6	**P** A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. **N** HTIN6030 OR HTIN6032 OR HTIN6011 OR HTIN6012. Students of the Master of Health Technology Innovation with Distinction average marks or above (after completion of 24 credit points) may choose either HTIN6010 or HTIN6011/HTIN6012 or HTIN6030/HTIN6032.	Semester 1 Semester 2
HTIN6011 Health Technology Innovation Capstone A	6	**N** HTIN6030 OR HTIN6032 OR HTIN6010 *A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Capstone project will be required to complete both HTIN6011 (6CPS) & HTIN6012 (6 CPS), totalling 12 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.*	Semester 1 Semester 2
HTIN6012 Health Technology Innovation Capstone B	6	**C** Corequisites: HTIN6011 **N** HTIN6030 OR HTIN6032 OR HTIN6010 *A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Capstone project will be required to complete both HTIN6011 (6CPS) & HTIN6012 (6 CPS), totalling 12 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.*	Semester 1 Semester 2
HTIN6030 Health Technology Innovation Thesis A	12	**N** HTIN6010 OR HTIN6011 OR HTIN6012 *A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Thesis project will be required to complete both HTIN6030 (12 CPS) & HTIN6032 (12 CPS), totaling 24 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.*	Semester 1 Semester 2
HTIN6032 Health Technology Innovation Thesis B	12	**C** Corequisite: HTIN6030 **N** HTIN6010 OR HTIN6011 OR HTIN6012 *A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Thesis project will be required to complete both HTIN6030 (12 CPS) & HTIN6032 (12 CPS), totaling 24 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.*	Semester 1 Semester 2
Health Technology Innovation Capstone Project			
A candidate for the Master of Health Technology Innovation must complete 24 credit points from Core, Specialist or Foundation units of study before taking the Health Technology Innovation Capstone Project. Candidates who do not achieve a credit average may have their eligibility for the Capstone Project subject to review by the Academic Director.			
The minimum requirement for the Health Technology Innovation Capstone Project is 12 credit points. Candidates can complete either HTIN6011 and HTIN6012 (6 +6 credit points over two semesters) or HTIN6010 (12 credit points in one semester).			
HTIN6011 Health Technology Innovation Capstone A	6	**N** HTIN6030 OR HTIN6032 OR HTIN6010 *A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Capstone project will be required to complete both HTIN6011 (6CPS) & HTIN6012 (6 CPS), totalling 12 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.*	Semester 1 Semester 2
HTIN6012 Health Technology Innovation Capstone B	6	**C** Corequisites: HTIN6011 **N** HTIN6030 OR HTIN6032 OR HTIN6010 *A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Capstone project will be required to complete both HTIN6011 (6CPS) & HTIN6012 (6 CPS), totalling 12 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.*	Semester 1 Semester 2
Health Technology Innovation Dissertation Project			
With permission from the Dean or nominee, a candidate for the Master of Health Technology Innovation who completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take Health Technology Innovation Dissertation Project units.			
The minimum requirement for the Health Technology Dissertation Project is 24 credit points (HTIN6030 and HTIN6032).			
HTIN6030 Health Technology Innovation Thesis A	12	**N** HTIN6010 OR HTIN6011 OR HTIN6012 *A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Thesis project will be required to complete both HTIN6030 (12 CPS) & HTIN6032 (12 CPS), totaling 24 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.*	Semester 1 Semester 2
HTIN6032 Health Technology Innovation Thesis B	12	**C** Corequisite: HTIN6030 **N** HTIN6010 OR HTIN6011 OR HTIN6012 *A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Thesis project will be required to complete both HTIN6030 (12 CPS) & HTIN6032 (12 CPS), totaling 24 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.*	Semester 1 Semester 2

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Health Technology Innovation

[[i||The first intake for the Graduate Diploma in Health Technology Innovation and the Master of Health Technology Innovation will be in Semester 2 2015. There will be no enrolments in these degrees for Semester 1]].Core, Specialist, Project and Foundation units of study for the Master of Health Technology Innovation and Graduate Diploma in Health Technology Innovation are shown in the following tables.Candidates for the Master of Health Technology Innovation are required to complete 96 credit points from the units of study as follows: 1. a minimum of 24 credit points of the Core units of study2. a minimum of 24 credit points of the Specialist units of study3. a minimum of 12 credit points of the Project units of study4. A maximum of 24 credit points of Foundation units of study. Candidates will be required to select units which complement their prior background and qualifications (subject to assessment by the Academic Director).Candidates for the Graduate Diploma in Health Technology Innovation are required to complete 60 credit points from the units of study as follows: 1. a minimum of 12 credit points of the Core units of study2. a minimum of 12 credit points of the Specialist units of study3. a maximum of 12 credit points of the Foundation units of studyIf a reduction in the volume of learning is given to candidates of the Graduate Diploma or the Master's degree, this is to be applied to Foundation or Specialist units of study related to your prior background and qualifications.

Core Units

Candidates for the Master of Health Technology Innovation must complete a minimum of 24 credit points from the listed Core units of study.

HTIN5001
Nature of Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2-3 hours per week; Laboratory: 8 hours overall. **Assumed knowledge:** The unit is aimed at graduates and researchers who are interested in developing skills in complex systems analysis. The unit is highly interdisciplinary and as such, there is no assumed prior knowledge or course prerequisites. However, students who will benefit most from the unit will be those who are open-minded and motivated to "think outside the box". The unit has been deliberately designed as a new teaching and learning experience. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This core unit of study aims to introduce the concept of integrative systems approaches to solving complex, multi-dimensional, multi-scale problems. Systems approaches are increasingly being recognised as essential for unravelling the complex network of influences on human health, from biology and nutrition to economics and society. The unit fosters new ways of thinking using systems approaches, which are key to identifying innovative solutions to the growing global health problems associated with diet and lifestyle.

HTIN5002
Quality Frameworks for Health Innovation

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hours per week **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

Introduces students to quality frameworks, and associated regulatory and legal frameworks within which medical research, clinical innovation and medical device development occurs. This unit will focus on explaining quality framework rationale and requirements. Practical research and development case studies will be utilized to identify interplay between frameworks and outcomes. This unit will allow students of a broad range of backgrounds to understand the role of quality frameworks in facilitating medical research, development and management, and the central importance of concise, consistent and coherent documentation of activity within quality frameworks to occur on a regular basis.

HTIN5003
Health Technology Evaluation

Credit points: 6 **Session:** Semester 2 **Classes:** Workshops: 3 teaching blocks x 2 days each. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

Many issues have been identified that are of potential relevance for planning, implementation and execution of an evaluation study in the health and technology innovations. This unit aims to address issues covering all phases of an evaluation study: Preliminary outline, study design, operationalization of methods, planning, execution and completion of the evaluation study. Students completing this unit will have better insights leading to a higher quality of evaluation studies for health technology solutions. This unit is an important component towards building stronger evidence and thus to progress towards evidence-based health solutions and technology innovations. Graduates of this unit of study will have a strong interdisciplinary knowledge base, covering diverse areas such as health, economics, health technologies, health informatics, social science and information systems. Topics areas covered: 1) Economic Aspects of Health Technology Evaluation; 2) The Development of Health Technologies and Health Informatics Evaluation; 3) The Role of Evaluation in the Use and Diffusion of Health Technology

HTIN5004
Integrated Approaches to Chronic Disease

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture/Tutorial 3 hours per week. **Assessment:** Through semester assessment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study aims to introduce the student to the strategy of the Charles Perkins Centre to ease the burden of obesity, diabetes and cardiovascular disease. While other approaches would focus on these diseases as purely medical conditions this unit will challenge the student to focus on an interdisciplinary approach, bringing together medicine, biological science, psychology, economics, law, agriculture and other disciplines to understand how real world solutions for these diseases might be developed. Students will be exposed to the world-renowned researchers based in the Charles Perkins Centre and will gain insight into the research strategy of the Centre. Students will also have the opportunity to develop a new interdisciplinary project node for the Centre in collaboration with one of our research leaders.

Specialist Units

Candidates for the Master of Health Technology Innovation must complete a minimum of 24 credit points from the listed Specialist units of study.

AMME5921
Biomedical Engineering Tech 2

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 4 hrs/week. **Assumed knowledge:** This is an introductory Masters of Engineering unit. A bachelors degree, ideally in the engineering or science field, is advisory, but not essential. **Assessment:** Through semester assessment (100%) **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.

AMME9961
Biomechanics and Biomaterials

Credit points: 6 **Session:** Semester 2 **Classes:** Lectures: 3 hours per week **Prohibitions:** AMME5961 **Assumed knowledge:** Chemistry, Biology, Materials Engineering, and Engineering Design at least at the Junior level. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This course is divided into two parts: biomechanics and biomaterials:

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.

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 metals, then polymers (thermoplastic, thermosetting, and biodegradable), and finally ceramics (bioinert, biodegradable, and bioactive).

AMME9971
Tissue Engineering

Credit points: 6 **Session:** Semester 1 **Classes:** Lectures: 2 hours per week; Tutorials: 2 hours per week **Prohibitions:** AMME5971 **Assumed knowledge:** 6 credit points of junior biology, 6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: The primary teaching delivery method will be lectures. This unit of study builds on the assumed knowledge of junior and intermediate biology and thus students will already have practical hands-on biological training. The purpose of this UoS is to elaborate the theory and latest developments of this very new field of tissue engineering, thereby building on the existing practical and theoretical knowledge base the students have in cell biology.

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:

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.

BETH5102
Philosophy of Medicine

Credit points: 6 **Teacher/Coordinator:** A/Prof Christopher Jordens **Session:** Semester 1 **Classes:** 12x2hr seminars or online. **Assessment:** 1x1200wd short written exercise (30%); 1x3000-4000wd major essay (60%); participation in seminars or online (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: If an insufficient number of students opt to attend seminars on campus, the co-ordinator may choose to teach this Unit of Study in online mode only. Students will be contacted if this occurs.

This unit of study introduces some key philosophical questions and debates concerning medicine and the biomedical sciences. It is divided into three sections. The first explores key concepts and distinctions such as health, disease, mental illness and disability. The second section deals with topics that lie at the heart of a scientific approach to medicine, namely, causation, experimentation, evidence and clinical reasoning. The final section of the course invites students to reflect critically on the preceding section by exploring the rationality claims of non-orthodox approaches, by inquiring closely into the meaning of medical terms, and by taking a broad view of the notion of risk.

All assessments must be completed to pass this Unit.

Textbooks

Required readings are available through the unit of study website. Supplementary readings can be accessed through the university library.

BETH5202
Human and Animal Research Ethics

Credit points: 6 **Teacher/Coordinator:** Dr Ainsley Newson **Session:** Semester 2 **Classes:** 4x8hr intensive or Distance Education (online). Attendance is compulsory if enrolled in face-to-face mode. **Prohibitions:** BETH5208 **Assessment:** Continuous assessment (short weekly tasks) (10%); `Best 3Â¿ short weekly tasks (10%); 1x1500wd briefing paper (30%); 1x2500wd essay (50%) **Mode of delivery:** Block mode

This unit of study critically examines research ethics in its wider context, from structuring research to its dissemination. It explores the ethical underpinnings of research in humans and non-human animals including the justifications for engaging in research, key concepts in research ethics and research integrity. The unit also reviews the history of research and the impact of research abuse on participants, both human and animal.Participants are also encouraged to develop practical skills in relation to their own research.

Textbooks

All readings are made available via elearning.

BETH5203
Ethics and Public Health

Credit points: 6 **Teacher/Coordinator:** A/Professor Stacy Carter **Session:** Semester 2 **Classes:** 5x8hr Intensives; or Distance Education (online). **Prerequisites:** A three-year undergraduate degree in science; medicine; nursing; allied health sciences; philosophy/ethics; sociology/anthropology; history; or other relevant field; or by special permission. **Prohibitions:** BETH5206 **Assessment:** 5xOnline Quiz (50%); 1x2500wd essay (50%) **Mode of delivery:** Online

This unit provides students with an overview of the ethical and political issues that underlie public health and public health research. The unit introduces key concepts in public health ethics including liberty, utility, justice, solidarity and reciprocity, and introduces students to different ways of reasoning about the ethics of public health. A critical history of public health and an examination of public health law provide important context. Students also explore the ethical dimensions of central public health problems, including modifying lifestyles, managing communicable diseases, researching communities, responding to global health challenges and using evidence. Throughout, the emphasis is on learning to make sound arguments about the ethical aspects of public health policy, practice and research. Most learning occurs in the context of five teaching intensives, which are highly interactive and focus on the development and application of reasoning skills.

Textbooks

Students are provided with a book of readings (in digital format).

CLTR5001
Trial Design and Methods

Credit points: 6 **Teacher/Coordinator:** Anne-Sophie Veillard, Adrienne Kirby **Session:** Semester 1 **Classes:** discussion groups and problem based learning **Assessment:** 2x quizzes (2x10%), 2x assignments (2x40%) **Mode of delivery:** Online

This unit of study will focus on the strengths and weaknesses of different clinical study designs. Designs considered will include cohort (retrospective and prospective), cross-sectional, case-control and randomized controlled designs. The different phases of clinical trial designs in the development of therapies will also be examined including phase I (first in man), phase II/pilot and phase III comparative designs. Extension and adaption of randomized designs will also be covered including cluster and factorial designs and adaptive pilot studies. Students will gain the skills necessary to choose between these designs for best practice. Types of outcomes (continuous, categorical, time-to-event) will be discussed. Methods of allocating participants to interventions (randomization), as well blinding and allocation concealment will be covered together with aspects of protocol development. On completion of this unit, the student will be familiar with the differences between study types and study designs, as well as the principles and practice of randomisation. It is also expected that the candidate will be able to develop stratified randomisation schemes for their own studies.

Textbooks

Recommended reading: Interpreting and Reporting of Clinical Trials: a guide to the Consort statement.

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5424
Information Technology in Biomedicine

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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, communication and security. Specialist areas such as Picture Archiving and Communication Systems (PACS), computer-aided diagnosis (CAD), 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.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

COMP5456
Introduction to Bioinformatics

This unit of study is not available in 2015

Credit points: 6 **Session:** Summer Main **Classes:** Laboratory 2 hrs/week; Lecture 2 hrs/week. **Prohibitions:** COMP3456 **Assumed knowledge:** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit brings together a wide range of skills 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. The unit covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research. It further 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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

INFO5306
Enterprise Healthcare Info Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS). **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Healthcare systems intimately coupled to ICT have been at the forefront of many of the medical advances in modern society in the past decade. As is already the case in many other service-driven sectors, it is widely recognised that a key approach to solve some of the healthcare challenges is to harness and further ICT innovations. This unit is designed to help fill a massive technology talent gap where one of the biggest IT challenges in history is in the technology transformation of healthcare.

The unit will consist of weekly lectures, a set of group discussions (tutorials) and practical lab sessions. The contents will offer students the opportunity to develop IT knowledge and skills related to all aspects of Enterprise Healthcare Information Systems. Key Topics covered include:

* Health Information System e.g., Picture Archiving and Communication Systems (PACS) and Radiology IS
* Electronic Health Records / Personal Health Records
* Health data management
* Healthcare Transactions
* Health Statistics and Research
* Decision Support Systems including Image-based systems
* Cost Assessments and Ethics / Privacy
* TeleHealth / eHealth
* Cases studies with Australian Hospitals

Guest lecturers from the healthcare industry will be invited. The core of student's assessments will be based on individual research reports (topics related to the current industry IT needs), software / practical assignment and quizzes.

INFO5992
Understanding IT Innovations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prohibitions:** PMGT5875 **Assumed knowledge:** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.

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.

ISYS5050
Knowledge Management Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The need to track and facilitate the sharing of the core knowledge resources in contemporary organisations is widely recognised. This course will provide a comprehensive introduction to the emerging area of Knowledge Management (KM) from both technological and organisational perspectives. We will review and discuss a range of published papers, case studies, and other publications that deal with a range of important KM-related topics. One of the key knowledge management technologies, Business Intelligence Systems, will be covered in detail. It will also include hands-on work using the BI (Online Analytical Processing - OLAP) tool, COGNOS.

Some of the main themes to be covered will include:

oKM: Conceptual Foundations

oTaxonomies of organizational knowledge and KM mechanisms

oCase/Field Studies of KM Initiatives

o Data Warehousing and OLAP/Business Analytics

oData, text, and web mining.

oSocial media,crowdsourcing, an KM

NURS5070
Creating a Culture of Safety and Quality

Credit points: 6 **Session:** Semester 2 **Classes:** distance education/intensive on campus, up to 4 study days **Assessment:** essay (45%) and case study (55%) **Mode of delivery:** Block mode

This unit of study pursues a critical analysis of the theoretical constructs and practical applications underpinning good clinical governance in health care organisations. Many studies identify the factors influencing a culture of safety and quality in the clinical environment and most concur with six main domains: the safety climate, teamwork, perceptions of management, working conditions, job satisfaction and stress recognition. These factors and how to influence them positively will be examined in this unit of study utilising a better practice (quality/continuity of care/health outcomes/governance) framework.

PUBH5224
Advanced Epidemiology

Credit points: 6 **Teacher/Coordinator:** Professor Tim Driscoll **Session:** Semester 2 **Classes:** Weekly classes (combined lectures and tutorials) for 13 weeks. **Prerequisites:** PUBH5010 or CEPI5100 **Assessment:** 1x 4000 word assignment (or equivalent answers to specific methodological questions) (70%), 1x 1500 word assignment or equivalent class presentation (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study is intended for students who have completed Epidemiology Methods and Uses (or an equivalent unit of study) at a credit or higher level. It is designed to provide students with an opportunity to consolidate critical appraisal skills, to acquire the practical knowledge and skills needed to design epidemiological research, and to extend students' theoretical knowledge of epidemiology beyond basic principles.

PUBH5422
Health and Risk Communication

Credit points: 6 **Teacher/Coordinator:** Associate Professor Julie Leask, Professor Phyllis Butow, Dr Claire Hooker **Session:** Semester 2 **Classes:** Block / intensive - 5 days Monday - Friday **Assessment:** Assignment 1 x 3000 word (55%), Assignment 2 x 2000 words (35%), Pre-block online activities (10%) **Mode of delivery:** Block mode

In this unit, students will develop a critical awareness of the determinants of effective communication, particularly in relation to health risks to the individual and to society.

The first half covers individual health risk communication in clinical settings, including: theories of health communication, patient centred care and shared decision making; evidence-based communication skills; research paradigms including interaction analysis; cross-cultural communication in health care; discussing prognosis and informed consent. The second half explores risk communication for public health. We teach theories of risk perception and communication with particular application to public health incident responses. We give practical guides to media messages, risk message framing, public engagement using traditional and social media, and the ethical aspects of public communication. The unit offers students the opportunity to learn from outstanding guest lecturers who work in these areas and interactive opportunities for students to try their skills in risk communication and decision making.

Textbooks

Readings will be provided

PUBH5500
Advanced Qualitative Health Research

Credit points: 6 **Teacher/Coordinator:** Dr Julie Mooney-Somers **Session:** Semester 1 **Classes:** 2x3 full day workshop in March/April **Prohibitions:** QUAL5005 **Assessment:** interviewing activity with 600wd reflection (35%); 2500wd essay (35%); multiple choice quizzes (2x10%); in-class participation (10%) **Mode of delivery:** Block mode

This unit of study provides a comprehensive introduction to qualitative inquiry in health. It is designed for beginners and people who want an advanced-level introduction. Workshop One addresses: What is qualitative research? How is it different from quantitative research? What is its history? What research questions can it answer? How can I search for qualitative literature? How do I design a qualitative study? What are the different (and best) ways to generate data? You will get practical experience and skills through carrying out an observation, participating in a focus group and conducting an interview. Workshop Two addresses: How do you analyse qualitative data? Is methodology different to method? What are ontology and epistemology? What is reflexivity (and aren't qualitative researchers biased)? What are the ethical issues? How are methodologies and theories used in qualitative research? What is good quality qualitative research? Can I generalise qualitative findings? You will get practical experience and skills through analysing your own interview data, arguing for qualitative research in health, and appraising the quality of published literature. In both workshops you will meet working qualitative researchers and hear about their projects. This advanced unit will show you a new way of thinking critically about research and researching, and give you the skills and confidence to begin evaluating and doing qualitative research for yourself.

Foundation Units

Students may complete a maximum of 24 credit points of the Foundation units of study. Candidates will be required to select units which complement their prior background and qualifications (subject to assessment by the Academic Director).

AMME5951
Fundamentals of Neuromodulation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 3 hrs/week. **Assumed knowledge:** Basic electronics at the junior or intermediate level, junior biology and chemistry, intermediate materials science, anatomy and physiology, senior engineering design practice, and biomedical engineering: BIOL1003 or 6 credit points of junior biology; CHEM1101 or 6 credit points of junior chemistry; AMME2302 or 6 credit points of materials science; ELEC2004 or 6 credit points of general electronics; MECH2901 or 6 credit points of intermediate physiology or equivalent. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Implantable microelectronic devices functioning either as nerve stimulators or nerve blockers comprise one of the largest markets in the global medical device industry. The aim of this unit of study is to give students a complete overview of the underlying technology (microelectronics, encapsulation biomaterials, electrode biomaterials, electrode-neural interactions, inductive power systems and data links, signal processing) and an expert review of the major technological applications on the market, which include Cochlear implants, pacemakers and implantable defibrillators, deep brain stimulators, pain control nerve blockers, bionic eye implants, functional electrical stimulation systems. The unit will also review emerging applications such as gastrointestinal disorders, obesity; vagal nerve stimulation - epilepsy, depression, carotid artery stimulation - hypertension, spinal cord stimulation - ischemic disorders, angina, peripheral vascular disease, incontinence, erectile dysfunction. The unit will conclude with a snapshot of the future: "brain on a chip" progress, nerve regrowth, neurotropins, drug/device combinations. This is a Master of Professional Engineering Unit of Study intended for biomedical engineering students with an interest in working in the medical device industry in the large market sector area of implantable electronic devices.

BETH5102
Philosophy of Medicine

Credit points: 6 **Teacher/Coordinator:** A/Prof Christopher Jordens **Session:** Semester 1 **Classes:** 12x2hr seminars or online. **Assessment:** 1x1200wd short written exercise (30%); 1x3000-4000wd major essay (60%); participation in seminars or online (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: If an insufficient number of students opt to attend seminars on campus, the co-ordinator may choose to teach this Unit of Study in online mode only. Students will be contacted if this occurs.

This unit of study introduces some key philosophical questions and debates concerning medicine and the biomedical sciences. It is divided into three sections. The first explores key concepts and distinctions such as health, disease, mental illness and disability. The second section deals with topics that lie at the heart of a scientific approach to medicine, namely, causation, experimentation, evidence and clinical reasoning. The final section of the course invites students to reflect critically on the preceding section by exploring the rationality claims of non-orthodox approaches, by inquiring closely into the meaning of medical terms, and by taking a broad view of the notion of risk.

All assessments must be completed to pass this Unit.

Textbooks

Required readings are available through the unit of study website. Supplementary readings can be accessed through the university library.

COMP5116
Design of Networks & Distributed Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit covers general foundations of communication systems and a detailed walk through of the implementation of the TCP/IP protocol stack, which forms the basis of the Internet. The unit also covers the basic knowledge of how to analyse, design and implement simple communication protocols.

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 and design.

COMP5206
Information Technologies and Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive introduction to the field of information systems from organisational and managerial perspectives. The emergence of the digital firm and its implications will be studied. The critical role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Key topics covered will include:

*Basic Information Systems Concepts

*Systems Approach and Systems Thinking

*E-Business and E-Commerce

*IT Strategy and Competitive Advantage

*Data and Knowledge Management

*Information Systems Development and IS Management

*Decision support systems, business intelligence and online analytical processing systems (OLAP)

*Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems, Enterprise Content Management and Supply Chain Management (SCM) systems

*Ethical, Legal and Social Aspects of Information technologis.

COMP9007
Algorithms

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour lectures and one 1 hour tutorial per week. **Prohibitions:** COMP5211 **Assumed knowledge:** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 computational thinking from simple list manipulation and data format conversion, up to shortest paths and cycle detection in graphs. Students will gain essential knowledge in computer science, including basic concepts in data structures, algorithms, and intractability, using paradigms such as dynamic programming, divide and conquer, greed, local search, and randomisation, as well NP-hardness.

COMP9103
Software Development in Java

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 1 hours per week **Prohibitions:** COMP5214 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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. Students will be progressively guided in 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.

COMP9120
Database Management Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 2 hour tutorial per week. **Prohibitions:** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content. **Assumed knowledge:** Some exposure to programming and some familiarity with data model concepts **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

Note that the first two thirds of the lectures of this foundational unit will be co-taught with the corresponding undergraduate class in semester 1 (INFO2120); tutorials and assignments will be organised separately.

COMP9220
Object-Oriented Design

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** : COMP5028 OR INFO3220 **Assumed knowledge:** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces essential object-oriented design methods and language mechanisms, especially the principles of modelling through Rational Unified Process and agile processes using Unified Modeling Language (UML) and Java or C++, both of which are industry standard. Students work in small groups to experience the process of object-oriented analysis, object-oriented design, implementation and testing by building a real-world application. Java or C++ is used as the implementation language and a special emphasis is placed on those features of Java or C++ that are important for solving real-world problems. Advanced software engineering features, including exceptions and name spaces are thoroughly covered.

INFO9003
IT for Health Professionals

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 6 hours per week; Laboratory: 6 hours per week **Prohibitions:** INFO5003 **Assessment:** Through-semester assessment (50%), Final Exam (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment.

Information technologies (IT) and systems have emerged as the primary platform to support communication, collaboration, research, decision making, and problem solving in contemporary health organisations. The essential necessity for students to acquire the fundamental knowledge and skills for applying IT effectively for a wide range of tasks is widely recognised. This is an introductory unit of study which prepares students in the Health 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 health 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. Students will undertake practical tasks including scripting languages and building a small scale application for managing information. In addition, the course will address the issues arising from the wide-spread use of information technology in a variety of Health area.

PUBH5010
Epidemiology Methods and Uses

Credit points: 6 **Teacher/Coordinator:** Professor Tim Driscoll **Session:** Semester 1 **Classes:** 1x 1hr lecture and 1x 2hr tutorial per week for 13 weeks - lectures and tutorials may be completed online **Prohibitions:** BSTA5011 **Assessment:** 1x 4page assignment (30%) and 1x 2.5hr supervised open-book exam (70%). For distance students, it may be possible to complete the exam externally with the approval of the course coordinator. **Mode of delivery:** Online

This unit provides students with core skills in epidemiology, particularly the ability to critically appraise public health and clinical epidemiological research literature. This unit covers: study types; measures of frequency and association; measurement bias; confounding/effect modification; randomized trials; systematic reviews; screening and test evaluation; infectious disease outbreaks; measuring public health impact and use and interpretation of population health data. It is expected that students spend an additional 2-3 hours at least preparing for their tutorials.

Textbooks

Webb, PW. Bain, CJ. and Pirozzo, SL. Essential Epidemiology: An Introduction for Students and Health Professionals Second Edition: Cambridge University Press 2011.

PUBH5018
Introductory Biostatistics

Credit points: 6 **Teacher/Coordinator:** Dr Kevin McGeechan and Dr Patrick Kelly **Session:** Semester 1 **Classes:** 2 x 2hr lecture, 10 x 1hr lectures, 11 x 2hr tutorials, 2 x 1hr and 8 x 0.5hr statistical computing self directed learning tasks over 12 weeks - lectures and tutorials may be completed online **Assessment:** 1x4 page assignment (30%) and 1x2.5hr open-book exam (70%). For distance students it may be possible to complete the exam externally with the approval of the course coordinator. **Mode of delivery:** Normal (lecture/lab/tutorial) evening

This unit aims to provide students with an introduction to statistical concepts, their use and relevance in public health. This unit covers descriptive analyses to summarise and display data; concepts underlying statistical inference; basic statistical methods for the analysis of continuous and binary data; and statistical aspects of study design. Specific topics include: sampling; probability distributions; sampling distribution of the mean; confidence interval and significance tests for one-sample, two paired samples and two independent samples for continuous data and also binary data; correlation and simple linear regression; distribution-free methods for two paired samples, two independent samples and correlation; power and sample size estimation for simple studies; statistical aspects of study design and analysis. Students will be required to perform analyses using a calculator and will also be required to conduct analyses using statistical software (SPSS). It is expected that students spend an additional 2 hours per week preparing for their tutorials. Computing tasks are self-directed.

Textbooks

Course notes are provided.

QUAL5002
Qualitative Methodologies & Study Design

Credit points: 6 **Teacher/Coordinator:** Dr Julie Mooney-Somers **Session:** Intensive May **Classes:** 2x3 full day workshop **Corequisites:** PUBH5500 **Assumed knowledge:** Basic understanding of the nature of qualitative knowledge and the processes of qualitative research. **Assessment:** group presentation (2x15%); peer review (2x10%); 4000wd assignment (50%) **Mode of delivery:** Block mode

Note: Departmental permission is required for students who have not completed PUBH5500.

Qualitative methodologies are historical traditions and systems for planning and justifying research methods. This intermediate unit assumes a basic understanding of qualitative research and focuses on qualitative methodologies. Qualitative methodologies are informed by theories from sociology, anthropology, philosophy and other disciplines. They shape the research questions, objectives, design and outcome of a qualitative study. This course begins with general principles of qualitative methodology and study design. We examine several qualitative methodologies in detail, including: narrative inquiry, community based participatory research, ethnography, grounded theory, arts-based, and qualitative synthesis. We consider their historical and theoretical roots, the research practices they encourage, and their current status. The final session considers how we can use methodologies as resources rather than recipes, maintaining both flexibility and coherence in our study designs.

Project Units

Candidates for the Master of Health Technology Innovation must complete a minimum of 12 credit points of Project units of study.

HTIN6010
Health Technology Innovation Capstone

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research: 18 hours per week. Meeting: 1 hour per week **Prerequisites:** A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. **Prohibitions:** HTIN6030 OR HTIN6032 OR HTIN6011 OR HTIN6012. Students of the Master of Health Technology Innovation with Distinction average marks or above (after completion of 24 credit points) may choose either HTIN6010 or HTIN6011/HTIN6012 or HTIN6030/HTIN6032. **Assessment:** Through semester assessment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

The Health Technology Innovation Capstone Project provides an opportunity to utilise technology to model and characterise a complex health challenge, preparing the way for future innovation and/or delivery of a novel technology solution to address an already well-defined health challenge. It is not expected that the project outcomes of this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and in a manner that fosters the development of skills in research or design. The student will be required to demonstrate the desired learning outcome of combining cross-disciplinary contexts of health & technology and management of these in this task. This learning requirement will provide a strong base for future research within the CPC network or work opportunities in the health industry upon completion of the MHTI program. Projects can be directly tied to a candidate's vocational objectives or interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of a software system or equipment. Candidates with experience and expertise from outside the health sector may be invited to partner with relevant team projects. Access to a registry of project opportunities, resources, consultants, co-supervisors will be provided. Students will generally work individually (or have an individual contribution to group project outcomes) for the semester.

HTIN6011
Health Technology Innovation Capstone A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research: 9 hours per week. Meeting 1 hour per week. **Prohibitions:** HTIN6030 OR HTIN6032 OR HTIN6010 **Assessment:** Through semester assessment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Capstone project will be required to complete both HTIN6011 (6CPS) & HTIN6012 (6 CPS), totalling 12 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.

The Health Technology Innovation Capstone Project provides an opportunity to utilise technology to model and characterise a complex health challenge, preparing the way for future innovation and/or delivery of a novel technology solution to address an already well-defined health challenge. It is not expected that the project outcomes of this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and in a manner that fosters the development of skills in research or design. The student will be required to demonstrate the desired learning outcome of combining cross-disciplinary contexts of health & technology and management of these in this task. This learning requirement will provide a strong base for future research within the CPC network or work opportunities in the health industry upon completion of the MHTI program. Projects can be directly tied to a candidate's vocational objectives or interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of a software system or equipment. Candidates with experience and expertise from outside the health sector may be invited to partner with relevant team projects. Access to a registry of project opportunities, resources, consultants, co-supervisors will be provided. Students will generally work individually (or have an individual contribution to group project outcomes) for the semester.

HTIN6012
Health Technology Innovation Capstone B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research: 9 hours per week. Meeting 1 hour per week. **Corequisites:** Corequisites: HTIN6011 **Prohibitions:** HTIN6030 OR HTIN6032 OR HTIN6010 **Assessment:** Through semester assessment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Capstone project will be required to complete both HTIN6011 (6CPS) & HTIN6012 (6 CPS), totalling 12 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.

The Health Technology Innovation Capstone Project provides an opportunity to utilise technology to model and characterise a complex health challenge, preparing the way for future innovation and/or delivery of a novel technology solution to address an already well-defined health challenge. It is not expected that the project outcomes of this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and in a manner that fosters the development of skills in research or design. The student will be required to demonstrate the desired learning outcome of combining cross-disciplinary contexts of health & technology and management of these in this task. This learning requirement will provide a strong base for future research within the CPC network or work opportunities in the health industry upon completion of the MHTI program. Projects can be directly tied to a candidate's vocational objectives or interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of a software system or equipment. Candidates with experience and expertise from outside the health sector may be invited to partner with relevant team projects. Access to a registry of project opportunities, resources, consultants, co-supervisors will be provided. Students will generally work individually (or have an individual contribution to group project outcomes) for the semester.

HTIN6030
Health Technology Innovation Thesis A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research: 16 hours per week. Meeting 2 hours per week. **Prohibitions:** HTIN6010 OR HTIN6011 OR HTIN6012 **Assessment:** Through semester assessment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Thesis project will be required to complete both HTIN6030 (12 CPS) & HTIN6032 (12 CPS), totaling 24 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.

The Health Technology Innovation Dissertation Project provides an opportunity to utilise technology to model and characterise a complex health challenge, preparing the way for future innovation and/or delivery of a novel technology solution to address an already well-defined health challenge. It is not expected that the project outcomes of this unit will represent a significant contribution to new knowledge. The unit 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 skills in original research or design. The student will be required to demonstrate the desired learning outcome of combining cross-disciplinary contexts of health & technology and management of these in this task. This learning requirement will provide a strong base for future research within the CPC network or work opportunities in the health industry upon completion of the MHTI program. Projects can be directly tied to a candidate's vocational objectives or interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of a software system or equipment. Candidates with experience and expertise from outside the health sector may be invited to partner with relevant team projects. Access to a registry of project opportunities, resources, consultants, co-supervisors will be provided. Students will generally work individually (or have an individual contribution to group project outcomes) for the semester.

HTIN6032
Health Technology Innovation Thesis B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research: 16 hours per week. Meeting 2 hours per week. **Corequisites:** Corequisite: HTIN6030 **Prohibitions:** HTIN6010 OR HTIN6011 OR HTIN6012 **Assessment:** Through semester assessment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Thesis project will be required to complete both HTIN6030 (12 CPS) & HTIN6032 (12 CPS), totaling 24 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.

The Health Technology Innovation Thesis provides an opportunity to utilise technology to model and characterise a complex health challenge, preparing the way for future innovation and/or delivery of a novel technology solution to address an already well-defined health challenge.

It is not expected that the project outcomes of this unit will represent a significant contribution to new knowledge. The unit 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 skills in original research or design.

The student will be required to demonstrate the desired learning outcome of combining cross-disciplinary contexts of health & technology and management of these in this task. This learning requirement will provide a strong base for future research within the CPC network or work opportunities in the health industry upon completion of the MHTI program.

Projects can be directly tied to a candidateÂ¿s vocational objectives or interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of a software system or equipment. Candidates with experience and expertise from outside the health sector may be invited to partner with relevant team projects. Access to a registry of project opportunities, resources, consultants, co-supervisors will be provided.

Students will generally work individually (or have an individual contribution to group project outcomes) for the semester.

Health Technology Innovation Capstone Project

A candidate for the Master of Health Technology Innovation must complete 24 credit points from Core, Specialist or Foundation units of study before taking the Health Technology Innovation Capstone Project. Candidates who do not achieve a credit average may have their eligibility for the Capstone Project subject to review by the Academic Director.The minimum requirement for the Health Technology Innovation Capstone Project is 12 credit points. Candidates can complete either HTIN6011 and HTIN6012 (6 +6 credit points over two semesters) or HTIN6010 (12 credit points in one semester).

HTIN6011
Health Technology Innovation Capstone A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research: 9 hours per week. Meeting 1 hour per week. **Prohibitions:** HTIN6030 OR HTIN6032 OR HTIN6010 **Assessment:** Through semester assessment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Capstone project will be required to complete both HTIN6011 (6CPS) & HTIN6012 (6 CPS), totalling 12 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.

The Health Technology Innovation Capstone Project provides an opportunity to utilise technology to model and characterise a complex health challenge, preparing the way for future innovation and/or delivery of a novel technology solution to address an already well-defined health challenge. It is not expected that the project outcomes of this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and in a manner that fosters the development of skills in research or design. The student will be required to demonstrate the desired learning outcome of combining cross-disciplinary contexts of health & technology and management of these in this task. This learning requirement will provide a strong base for future research within the CPC network or work opportunities in the health industry upon completion of the MHTI program. Projects can be directly tied to a candidate's vocational objectives or interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of a software system or equipment. Candidates with experience and expertise from outside the health sector may be invited to partner with relevant team projects. Access to a registry of project opportunities, resources, consultants, co-supervisors will be provided. Students will generally work individually (or have an individual contribution to group project outcomes) for the semester.

HTIN6012
Health Technology Innovation Capstone B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research: 9 hours per week. Meeting 1 hour per week. **Corequisites:** Corequisites: HTIN6011 **Prohibitions:** HTIN6030 OR HTIN6032 OR HTIN6010 **Assessment:** Through semester assessment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Capstone project will be required to complete both HTIN6011 (6CPS) & HTIN6012 (6 CPS), totalling 12 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.

The Health Technology Innovation Capstone Project provides an opportunity to utilise technology to model and characterise a complex health challenge, preparing the way for future innovation and/or delivery of a novel technology solution to address an already well-defined health challenge. It is not expected that the project outcomes of this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and in a manner that fosters the development of skills in research or design. The student will be required to demonstrate the desired learning outcome of combining cross-disciplinary contexts of health & technology and management of these in this task. This learning requirement will provide a strong base for future research within the CPC network or work opportunities in the health industry upon completion of the MHTI program. Projects can be directly tied to a candidate's vocational objectives or interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of a software system or equipment.

Candidates with experience and expertise from outside the health sector may be invited to partner with relevant team projects. Access to a registry of project opportunities, resources, consultants, co-supervisors will be provided. Students will generally work individually (or have an individual contribution to group project outcomes) for the semester.

Health Technology Innovation Dissertation Project

With permission from the Dean or nominee, a candidate for the Master of Health Technology Innovation who completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take Health Technology Innovation Dissertation Project units.The minimum requirement for the Health Technology Dissertation Project is 24 credit points (HTIN6030 and HTIN6032).

HTIN6030
Health Technology Innovation Thesis A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research: 16 hours per week. Meeting 2 hours per week. **Prohibitions:** HTIN6010 OR HTIN6011 OR HTIN6012 **Assessment:** Through semester assessment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Thesis project will be required to complete both HTIN6030 (12 CPS) & HTIN6032 (12 CPS), totaling 24 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.

The Health Technology Innovation Dissertation Project provides an opportunity to utilise technology to model and characterise a complex health challenge, preparing the way for future innovation and/or delivery of a novel technology solution to address an already well-defined health challenge. It is not expected that the project outcomes of this unit will represent a significant contribution to new knowledge. The unit 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 skills in original research or design.The student will be required to demonstrate the desired learning outcome of combining cross-disciplinary contexts of health & technology and management of these in this task. This learning requirement will provide a strong base for future research within the CPC network or work opportunities in the health industry upon completion of the MHTI program. Projects can be directly tied to a candidate's vocational objectives or interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of a software system or equipment. Candidates with experience and expertise from outside the health sector may be invited to partner with relevant team projects. Access to a registry of project opportunities, resources, consultants, co-supervisors will be provided. Students will generally work individually (or have an individual contribution to group project outcomes) for the semester.

HTIN6032
Health Technology Innovation Thesis B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research: 16 hours per week. Meeting 2 hours per week. **Corequisites:** Corequisite: HTIN6030 **Prohibitions:** HTIN6010 OR HTIN6011 OR HTIN6012 **Assessment:** Through semester assessment (100%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A candidate for the Master of Health Technology Innovation who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the Health Technology Innovation Thesis project will be required to complete both HTIN6030 (12 CPS) & HTIN6032 (12 CPS), totaling 24 CPS. Eligible students of the Master of Health Technology Innovation with a Distinction average or above (after completion of 24 credit points) may choose HTIN6010, HTIN6011/HTIN6012 or HTIN6030/HTIN6032.

The Health Technology Innovation Thesis provides an opportunity to utilise technology to model and characterise a complex health challenge, preparing the way for future innovation and/or delivery of a novel technology solution to address an already well-defined health challenge.

It is not expected that the project outcomes of this unit will represent a significant contribution to new knowledge. The unit 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 skills in original research or design.

The student will be required to demonstrate the desired learning outcome of combining cross-disciplinary contexts of health & technology and management of these in this task. This learning requirement will provide a strong base for future research within the CPC network or work opportunities in the health industry upon completion of the MHTI program.

Projects can be directly tied to a candidateÂ¿s vocational objectives or interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of a software system or equipment. Candidates with experience and expertise from outside the health sector may be invited to partner with relevant team projects. Access to a registry of project opportunities, resources, consultants, co-supervisors will be provided.

Students will generally work individually (or have an individual contribution to group project outcomes) for the semester.

For more information on units of study visit CUSP.

Master of Information Technology

Course overview

The Master of Information Technology (MIT) is an internationally recognised degree offering nine majors within the four key areas of software, business, engineering and health.

Students can choose to focus on one particular area or there is the flexibility to combine subjects from related majors.

All candidates need to complete a defined major. Majors are available in:

- software engineering
- computer science
- computer networks
- multimedia technology
- database management
- business information systems
- health informatics
- information technology project management
- telecommunications engineering.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Accreditation

The MIT is recognised as an industry-relevant award and has been accredited by the Australian Computer Society as a Professional Level course.

Information Technology

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
GCINFTEC-02	Graduate Certificate in Information Technology
GNINFTEC-02	Graduate Diploma in Information Technology
MAINFTEC	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 or higher award in Information Technology from the University of Sydney, or qualifications deemed by the School of IT deemed to be equivalent in any aspect of Information Technology; or
(b) a Bachelor's degree or higher award in Engineering from the University of Sydney with a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering, or qualifications deemed by the School of IT to be equivalent.
(3) Admission to the Graduate Diploma in Information Technology requires:
(a) a Bachelor's degree or higher award in Information Technology from the ~~Unviersity~~ University of Sydney with at least a credit average, or qualifications deemed by the School of Information Technology to be equivalent in any aspect of Information Technology; or
(b) a Bachelor's degree or higher award in Engineering from the University of Sydney with at least a credit average and a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering, or qualifications deemed by the School of Information Technology to be equivalent; 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 or higher award in Information Technology from the University of Sydney with at least a credit average, or qualifications deemed by the School of IT to be equivalent in any aspect of Information Technology; or
(b) a Bachelor's degree of higher award in Engineering from the University of Sydney with at least a credit average and a major sequence of study in Computer Engineering, Software Engineering, or Telecommunications Engineering, or qualifications deemed by the School of IT to be equivalent; or
(c) completion of the requirements of the embedded Graduate Diploma or Graduate Certificate in this discipline with at least a credit average.
(d) completion of the Graduate Diploma in Computing from the University of Sydney with at least a credit average.
(5) If a candidate does not have a credit average within the qualifications listed above, they may be admitted to the Graduate Certificate subject to the discretion of the Dean or nominee.
(6) In exceptional circumstances the Dean or nominee may admit applicants without these qualifications who, in the opinion of the School of IT, 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 Academic Director:
(a) Master of Information Technology: a maximum of 12 credit points may be selected from units outside the School of IT (i.e. outside of COMP, INFO and ISYS coded units).
(b) Graduate Certificate or Graduate Diploma in Information Technology: a maximum of 6 credit points may be selected from units outside the School of IT (i.e. outside of COMP, INFO and ISYS coded units).
(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, including:

(a) a minimum of the 12 credit points of the Specialist units of study from the table of units of study excluding Project units; and
(b) a maximum of 12 credit points of the Foundation units of study.
(4) To qualify for the Graduate Diploma in Information Technology a candidate must complete 48 credit points, including:
(a) a minimum of 6 credit points of the Core units of study (including INFO5990); and
(b) a minimum of 12 credit points of the Specialist units of study from the table of units of study excluding Project units.
(c) a maximum of 12 credit points of the Foundation units of study.
(5) To qualify for the Master of Information Technology a candidate must complete 72 credit points of units of study as specified in the degree table, including:
(a) for the Professional Pathway:
(i) 18 credit points of the Core units of study; and
(ii) a minimum of 18 credit points of the Specialist units of study; and
(iii) a minimum of 12 credit points of the Professional Pathway Project units of study; and
(iv) a maximum of 12 credit points of the Foundation units of study; and
(v) no credit points from the Research Pathway units of study.
(b) for the Research Pathway:
(i)
(ii) a minimum of 12 credit points of the Specialist units of study; and
(iii) a minimum of 24 credit points of the Research Pathway units of study; and
(iv) a maximum of 12 credit points of the Foundation units of study; and
(v) no credit points from the Professional Pathway Project units of study.
(c) If a reduction in the volume of learning is given then the candidate is able to apply for an exemption from some course requirements, if evidence can be provided of prior learning (subject to assessment by the Academic Director). The candidate will then be required to complete the required volume of learning based on the remaining course requirements.

7 Majors

(1) Completion of a major is an optional requirement of the Master of Information Technology. A major requires the completion of all core units of study as prescribed by the Faculty and at least 18 credit points chosen from the Specialist units of study listed in the table for the defined major. The majors available are:
(a) Digital Media Technology
(b) Data Management and Analytics
(c) Biomedical and Health Informatics
(d) Networks and Distributed Systems
(e) Software Engineering
(f) Telecommunications Engineering

8 Progression Rules

(1) A candidate for the Master of Information Technology must complete 24 credit points from Specialist, or Foundation units of study 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 Specialist or Foundation units of study with 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 (for non-conferred qualifications only)

(1) The following coursework rules (for non-conferred qualifications) replace the Faculty Coursework Rules for "Credit for Previous Study" within the Resolutions of the Faculty (of Engineering and Information Technologies) for the Master of Information Technology.
(a) where postgraduate study has been undertaken at the University of Sydney in one of the embedded courses of the Master of Information Technology or Master of Information Technology Management, and no award has been conferred, credit may be transferred in full (subject to credit limits in the table of units of study: Master of Information Technology), provided the study has been undertaken within the previous three years and subject to approval of the Academic Director. In addition, a credit transfer for the purposes of a course upgrade will require either:
(i) Fulfilment of the admission requirements for the "Admission to Candidature" for the Master of Information Technology including at least a credit average from the prior qualification used for admission; or
(ii) completion of a minimum of 24 credit points of the currently enrolled course with at least a credit average.
(b) a candidate for the Graduate Diploma in Computing may transfer to the Master of Information Technology upon completion of a minimum of 24 credit points with a credit average, subject to the approval of the Academic Director, with the following conditions:
(I) credit may not be transferred from the first 24 credit points of units of study of the Graduate Diploma in Computing.
(II) credit after the first 24 credit points of units of study in the Graduate Diploma in Computing may be transferred in full (subject to credit limits in the table of units of study: Master of Information Technology).
(III) The study has been undertaken within the previous three years.
(iv) No award has been conferred.
(c) where study not covered in (a) or (b) above has been undertaken at postgraduate level and no award has been conferred, credit 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 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.
(d) Credit will not be granted for recognised prior learning older than 10 years at the time of first enrolment.

13 Recognition for Prior Learning (for conferred qualifications only)

(1) The following Coursework Rules (for conferred qualifications) replace the Faculty Course work Rules for "Credit for previous study" within the Resolutions of the Faculty (of Engineering and Information Technologies) for the Master of Information Technology:

(a) where study has been undertaken and an award has been conferred, candidates who are offered direct admission to the Master of Information Technology may be eligible for a reduction in the volume of learning of up to 36 credit points, provided that study for the conferred award has been undertaken at an external institution recognized by the ~~Unviersity~~ University of Sydney within the previous three years. Any reduction in the volume of learning is subject to the following guidelines and requires the approval of the Academic Director.

(i) the maximum permissible reduction in the volume of learning is 36 credit points for a Master's degree (at Level 9 of the Australian Qualifications Framework) in the discipline of Information Technology, as defined by the School of IT.

(ii) the maximum permissible reduction in the volume of learning is 24 credit points for a Bachelor's degree with Honours (at Level 8 of the Australian Qualification Framework) in the discipline of Information Technology, as defined by the School of IT.

(iii) the maximum permissible reduction in the volume of learning is 24 credit points for a Bachelor's degree with Honours (at Level 8 of the Australian Qualification Framework) in the discipline of Engineering, as defined by the School of IT, with a major sequence of study in Computer Engineering, Software Engineering, or Telecommunications Engineering.

(iv) the maximum permissible reduction in the volume of learning is 12 credit points for a Graduate Diploma (at Level 8 of the Australian Qualification Framework) in the discipline of Information Technology, as defined by the School of IT.

(v) the maximum permissible reduction in the volume of learning is 12 credit points for a four-year Bachelor of Information Technology (pass) (course code: BPINFTEC2000) only at the University of Sydney (at Level 7 of the Australian Qualifications Framework).

14 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.

15 Satisfactory Progress

Progression is subject to the Coursework Rule. A candidate who has failed to meet these progression rules for ~~hter~~ the Master of Information Technology will be transferred to either the Graduate Diploma or Graduate Certificate in Information Technology, depending on the credit points successfully completed.

16 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 eight 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 twelve semesters.

17 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2015 and students who commenced their candidature prior to 1 January, 2015 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2015 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Unit of study table

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Master of Information Technology			
Candidates for the degree of Master of Information Technology are required to complete 72 credit points from the units of study as follows.			
Candidates for the Master of Information Technology commence their enrolment in the Professional Pathway. After completing 24 credit points of course work, candidates who achieve 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.			
For the Professional Pathway, complete the following:			
1. 18 credit points of Core units of study; and			
2. a minimum of 18 credit points of Specialist units of study; and			
3. a maximum of 12 credit points of Foundation units of study; and			
4. a minimum of 12 credit points of Professional Pathway Project units of study; and			
5. no credit points of Research Pathway units of study.			
For the Research Pathway, complete the following:			
1. a minimum of 18 credit points of the Core units of study; and			
2. a minimum of 12 credit points of Specialist units of study; and			
3. a maximum of 12 credit points of Foundation units of study; and			
4. a minimum of 24 credit points of Research Pathway units of study; and			
5. no credit points of Professional Pathway Project units of study.			
Candidates for the Graduate Diploma in Information Technology are required to complete 48 credit points from the units of study as follows:			
1. a minimum of 6 credit points of Core units of study including INFO5990; and			
2. a minimum of 12 credit points of Specialist units of study.			
3. no credit points of Project or Research units of study.			
To qualify for the Graduate Certificate in Information Technology a candidate must complete 24 credit points of units of study as follows:			
1. a minimum of 12 credit points of Specialist units of study; and			
2. a maximum of 12 credit points of Foundation units of study.			
3. no credit points of Project or Research units of study.			
Core units			
Candidates for the Master of Information Technology complete a minimum of 18 credit points of Core units.			
Candidates for the Graduate Diploma take INFO5990 as a minimum Core unit of study requirement.			
INFO5990 **Professional Practice in IT**	6	**A** Students enrolled in INFO5990 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have many years experience as a practising IT professional. *The main focus of the subject is to provide students with the necessary tools, basic skills, experience and adequate knowledge so they develop an awareness and an understanding of the responsibilities and issues associated with professional conduct and practice in the information technology sector.*	Semester 1 Semester 2
INFO5992 **Understanding IT Innovations**	6	**A** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **N** PMGT5875 *A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.*	Semester 1 Semester 2
INFO6007 **Project Management in IT**	6	**A** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **N** PMGT5871	Semester 1 Semester 2
Specialist units			
Candidates for the Masters of Information Technology take a minimum of 18 credit points of Specialist units for hte Professional Pathway and a minimum of 12 credit points for the Research Pathway.			
Candidates for the Graduate Diploma or Graduate Certificate take a minimum 12 credit points of Specialist units.			
CISS6022 **Cybersecurity**	6		Semester 1
COMP5045 **Computational Geometry**	6	**A** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees.	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5048 **Visual Analytics**	6	**A** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills.	Semester 2
COMP5206 **Information Technologies and Systems**	6		Semester 1 Semester 2
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5313 **Large Scale Networks**	6	**A** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. *Note: Department permission required for enrolment*	Semester 1
COMP5318 **Knowledge Discovery and Data Mining**	6	**A** INFO9120 OR COMP5138	Semester 1
COMP5338 **Advanced Data Models**	6	**A** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1).	Semester 2
COMP5347 **Web Application Development**	6	**A** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams.	Semester 1
COMP5348 **Enterprise Scale Software Architecture**	6	**A** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.	Semester 1
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1
COMP5415 **Multimedia Design and Authoring**	6	**A** COMP5114 or COMP9419.	Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
COMP5424 **Information Technology in Biomedicine**	6		Semester 1
COMP5425 **Multimedia Retrieval**	6	**A** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge.	Semester 1
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	Semester 1
COMP5427 **Usability Engineering**	6		Semester 2
COMP5456 **Introduction to Bioinformatics** *This unit of study is not available in 2015*	6	**A** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **N** COMP3456	Summer Main
ELEC5507 **Error Control Coding**	6	**A** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired.	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
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.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	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) **N** MECH5701	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2
IDEA9106 **Design Thinking**	6		Semester 1 Semester 2
INFO5010 **IT Advanced Topic A**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Late
INFO5011 **IT Advanced Topic B** *This unit of study is not available in 2015*	6	**N** INFO4011	Semester 1 Semester 2 Winter Main
INFO5060 **Data Analytics and Business Intelligence**	6	**A** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems	Summer Early
INFO5301 **Information Security Management**	6	**A** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable.	Semester 1
INFO5306 **Enterprise Healthcare Info Systems**	6	**A** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS).	Semester 2
INFO6010 **Advanced Topics in IT Project Management**	6	**A** Students are assumed to understand the role of IT projects. **P** INFO6007, OR 3-5 years working experience in IT Project Management	Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.	Semester 1
PUBH5010 **Epidemiology Methods and Uses**	6	**N** BSTA5011	Semester 1
STAT5003 **Computational Statistical Methods**	6	**P** STAT5002 *Note: Department permission required for enrolment*	Semester 2
Elective units			
COMP5705 **Information Technology Short Project**	6	**N** COMP5704, COMP5703, COMP5702 *Specialist/Elective/Project*	Semester 1 Semester 2 Summer Late Winter Main
COMP5706 **IT Industry Placement Project**	6	**N** COMP5702, COMP5703, COMP5704	Semester 1 Semester 2
INFO5301 **Information Security Management**	6	**A** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable.	Semester 1
INFO5991 **Services Science Management and Eng**	6	**A** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business. *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO6012 **Information Technology Strategy & Value**	6	**A** COMP5206. Introduction to Information Systems	Semester 2
INFS6012 **Enterprise Systems Management**	6	*This is a defined elective unit of study in both the Master of Professional Accounting and the Master of Commerce programs.*	Semester 1
INFS6015 **Business Process Management**	6		Semester 2
INFS6016 **Technology Enabled Business Innovation**	6	**A** Understanding the major functions of a business and how those business functions interact internally and externally so the company can be competitive in the market is essential in order to critically analyse how and where a business can be innovative. Some knowledge of how technology can be applied in a business is also essential. Experience as a member of a project team is desirable.	Semester 2
INFS6018 **Managing Business Intelligence**	6		Semester 1
ISYS5070 **Change Management in IT**	6	**A** The unit is expected to be taken after the following related units INFO6007 Project Managemnet in IT and COMP5206 Introduction to Information Systems.	Winter Main
Foundation units			
Candidates for the Master of Information Technology and the Graduate Certificate in Information Technology take a maximum of 12 credit points of Foundation units of study.			
COMP5116 **Design of Networks & Distributed Systems**	6		Semester 2
COMP5213 **Computer and Network Organisation**	6		Semester 1
COMP9007 **Algorithms**	6	**A** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **N** COMP5211	Semester 2
COMP9103 **Software Development in Java**	6	**N** COMP5214	Semester 1 Semester 2
COMP9110 **System Analysis and Modelling**	6	**A** Experience with a data model as in COMP9129 or COMP9103 or INFO9220 or INFO9120 or COMP5212 or COMP5214 or COMP5028 or COMP5138 **N** : ELEC3610 OR ELEC5743 OR INFO2110 OR INFO5001	Semester 2
COMP9120 **Database Management Systems**	6	**A** Some exposure to programming and some familiarity with data model concepts **N** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content.	Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP9220 **Object-Oriented Design**	6	**A** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **N** : COMP5028 OR INFO3220	Semester 1
COMP9419 **Digital Media Fundamentals**	6	**N** COMP5114	Semester 1
INFO9003 **IT for Health Professionals**	6	**N** INFO5003 *Note: Department permission required for enrolment*	Semester 2
INFO9117 **Intro to Software Engineering Practice**	6	**A** Skill as an individual programmer (as expected from any IT graduate, who could be admitted to GCertIT, GDipIT or MIT degree)	Semester 1 Semester 2
PUBH5018 **Introductory Biostatistics**	6		Semester 1
STAT5002 **Introduction to Statistics**	6	**A** HSC Mathematics	Semester 1

Professional Pathway Project units

24 credit points of Core, Specialist or Foundation units must be completed with at least Credit average marks before enrolling in any Project units of study.

The minimum requirement for the Professional Practice pathway is 12 credit points of Information Technology Capstone project units. These can be taken as COMP5707 and COMP5708 over two semesters, or as COMP5703 in one semester.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5703 **Information Technology Project**	12	**P** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. **N** : COMP5702 OR COMP5704 OR COMP5707 OR COMP5708	Semester 1 Semester 2
COMP5707 **Information Technology Capstone A**	6	**N** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2
COMP5708 **Information Technology Capstone B**	6	**C** Corequisite: COMP5707 **N** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2

Research Pathway units

Candidates who achieve Distinction (75%) average results or above over the first 24 credit points may gain admission to the Research pathway, subject to the approval of the Program Director.

Candidates who pursue the Research path take INFO5993 instead of INFO5990.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5702 **IT Research Project A**	12	**A** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **N** : COMP5707 OR COMP5708 OR COMP5703. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2
COMP5704 **IT Research Project B**	6	**A** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **P** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take this unit. **N** : COMP5707 OR COMP5708 OR COMP5703. Students enrolling (and eligible) for the IT Research Project are not eligible to enrol in the IT Capstone Project Units. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2
INFO5993 **IT Research Methods**	6		Semester 1 Semester 2

Majors for the Master of Information Technology

A major requires the completion of all core units of study as prescribed for this degree and at least 18 credit points chosen from the Specialist units of study listed in the tables below for the defined majors.

Biomedical and Health Informatics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5206 **Information Technologies and Systems**	6		Semester 1 Semester 2
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5424 **Information Technology in Biomedicine**	6		Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5427 **Usability Engineering**	6		Semester 2
COMP5456 **Introduction to Bioinformatics** *This unit of study is not available in 2015*	6	**A** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **N** COMP3456	Summer Main
INFO5306 **Enterprise Healthcare Info Systems**	6	**A** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS).	Semester 2
PUBH5010 **Epidemiology Methods and Uses**	6	**N** BSTA5011	Semester 1
Data Management and Analytics			
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5048 **Visual Analytics**	6	**A** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills.	Semester 2
COMP5318 **Knowledge Discovery and Data Mining**	6	**A** INFO9120 OR COMP5138	Semester 1
COMP5338 **Advanced Data Models**	6	**A** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1).	Semester 2
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1
COMP5425 **Multimedia Retrieval**	6	**A** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge.	Semester 1
INFO5060 **Data Analytics and Business Intelligence**	6	**A** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems	Summer Early
ISYS5050 **Knowledge Management Systems**	6	**A** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.	Semester 1
STAT5003 **Computational Statistical Methods**	6	**P** STAT5002 *Note: Department permission required for enrolment*	Semester 2
Digital Media Technology			
CISS6022 **Cybersecurity**	6		Semester 1
COMP5045 **Computational Geometry**	6	**A** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees.	Semester 1
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5048 **Visual Analytics**	6	**A** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills.	Semester 2
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5347 **Web Application Development**	6	**A** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams.	Semester 1
COMP5415 **Multimedia Design and Authoring**	6	**A** COMP5114 or COMP9419.	Semester 2
COMP5425 **Multimedia Retrieval**	6	**A** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge.	Semester 1
COMP5427 **Usability Engineering**	6		Semester 2
IDEA9106 **Design Thinking**	6		Semester 1 Semester 2
Networks and Distributed Systems			
CISS6022 **Cybersecurity**	6		Semester 1
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5313 **Large Scale Networks**	6	**A** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. *Note: Department permission required for enrolment*	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	Semester 1
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
Software Engineering			
CISS6022 **Cybersecurity**	6		Semester 1
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5347 **Web Application Development**	6	**A** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams.	Semester 1
COMP5348 **Enterprise Scale Software Architecture**	6	**A** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.	Semester 1
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1
COMP5427 **Usability Engineering**	6		Semester 2
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2
Telecommunications Engineering			
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
ELEC5507 **Error Control Coding**	6	**A** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired.	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
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.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	Semester 2

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Information Technology

Candidates for the degree of Master of Information Technology are required to complete 72 credit points from the units of study as follows.Candidates for the Master of Information Technology commence their enrolment in the Professional Pathway. After completing 24 credit points of course work, candidates who achieve 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. For the Professional Pathway, complete the following:1. 18 credit points of Core units of study; and2. a minimum of 18 credit points of Specialist units of study; and3. a maximum of 12 credit points of Foundation units of study; and4. a minimum of 12 credit points of Professional Pathway Project units of study; and5. no credit points of Research Pathway units of study.For the Research Pathway, complete the following:1. a minimum of 18 credit points of the Core units of study; and2. a minimum of 12 credit points of Specialist units of study; and3. a maximum of 12 credit points of Foundation units of study; and4. a minimum of 24 credit points of Research Pathway units of study; and5. no credit points of Professional Pathway Project units of study.Candidates for the Graduate Diploma in Information Technology are required to complete 48 credit points from the units of study as follows:1. a minimum of 6 credit points of Core units of study including INFO5990; and 2. a minimum of 12 credit points of Specialist units of study.3. no credit points of Project or Research units of study.To qualify for the Graduate Certificate in Information Technology a candidate must complete 24 credit points of units of study as follows:1. a minimum of 12 credit points of Specialist units of study; and2. a maximum of 12 credit points of Foundation units of study.3. no credit points of Project or Research units of study.

Core units

Candidates for the Master of Information Technology complete a minimum of 18 credit points of Core units.Candidates for the Graduate Diploma take INFO5990 as a minimum Core unit of study requirement.

INFO5990
Professional Practice in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students enrolled in INFO5990 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have many years experience as a practising IT professional. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: The main focus of the subject is to provide students with the necessary tools, basic skills, experience and adequate knowledge so they develop an awareness and an understanding of the responsibilities and issues associated with professional conduct and practice in the information technology sector.

This Unit of Study introduces the students to some of the concepts, standards and techniques associated with the current professional practice in information technology in the business environment.

Students will encounter a range of concepts, techniques and professional issues including interpersonal and organisational communication, human resources and conflict resolution, globalisation, professional ethics, social impacts of IT, data security, data quality assurance, system audit, investigative research and project management practice. Practical and real world case studies will be used as part of the learning to enhance the in-class teachings to the needs of industry.

INFO5992
Understanding IT Innovations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prohibitions:** PMGT5875 **Assumed knowledge:** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.

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.

INFO6007
Project Management in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture Workshop 3 hrs/week; WeeklyAssignments 5 hrs; Exam Preparation 16 hrs. **Prohibitions:** PMGT5871 **Assumed knowledge:** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers the factors necessary for successful management of a wide variety of Information Technology projects. The course covers both quantitative and qualitative aspects of project management. Topics include the management of time, scope, budget, risk, quality, and resources through each of the phases of a project.

Specialist units

Candidates for the Masters of Information Technology take a minimum of 18 credit points of Specialist units for hte Professional Pathway and a minimum of 12 credit points for the Research Pathway.Candidates for the Graduate Diploma or Graduate Certificate take a minimum 12 credit points of Specialist units.

CISS6022
Cybersecurity

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week **Assessment:** 1x2hr exam (40%), 1x3000wd analytical Essay (40%), 1x1000wd equivalent lab exercise (10%), 1xSeminar participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The digital revolution has created new frontiers of information that influence almost every aspect of our lives. But does cyberspace also threaten our security? What are the methods and motives for attack?

And how can state and non-state actors respond? Drawing on a unique combination of expertise from the Centre for International Security Studies and the School of Information Technologies, this unit introduces students to the technical and political concepts that are necessary to answer these important questions.

COMP5045
Computational Geometry

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - in class 12 hrs/week. **Assumed knowledge:** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees. **Assessment:** Through semester assessment (80%) Final Exam (20%) **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 geometric 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.

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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
Visual Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Visual Analytics aims to facilitate the data analytics process through Information Visualisation. Information Visualisation aims 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 challenge for Visual Analytics is to design and implement "effective Visualisation methods that produce pictorial representation of complex data so that data analysts from various fields (bioinformatics, social network, software visualisation and network) can visually inspect complex data and carry out critical decision making.

This unit will provide basic HCI concepts, Visualisaiton 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 Visual Analytic methods.

COMP5206
Information Technologies and Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive introduction to the field of information systems from organisational and managerial perspectives. The emergence of the digital firm and its implications will be studied. The critical role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Key topics covered will include:

*Basic Information Systems Concepts

*Systems Approach and Systems Thinking

*E-Business and E-Commerce

*IT Strategy and Competitive Advantage

*Data and Knowledge Management

*Information Systems Development and IS Management

*Decision support systems, business intelligence and online analytical processing systems (OLAP)

*Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems, Enterprise Content Management and Supply Chain Management (SCM) systems

*Ethical, Legal and Social Aspects of Information technologis.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5313
Large Scale Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The growing connectedness of modern society translates into simplifying global communication and accelerating spread of news, information and epidemics. The focus of this unit is on the key concepts to address the challenges induced by the recent scale shift of complex networks. In particular, the course will present how scalable solutions exploiting graph theory, sociology, game theory and probability tackle the problems of communicating (routing, diffusing, aggregating) in dynamic and social networks.

COMP5318
Knowledge Discovery and Data Mining

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** INFO9120 OR COMP5138 **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 for data, by automatic and 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

COMP5338
Advanced Data Models

Credit points: 6 **Session:** Semester 2 **Classes:** Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1). **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 data storage technology.

Particular emphasis is put on spatial, temporal, and NoSQL data storage. This unit extensively covers the advanced features of SQL:2003, as well as a few dominant NoSQL storage technologies. Besides in lectures, the advanced topics will be also studied with prescribed readings of database research publications.

COMP5347
Web Application Development

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week; Project Work - own time 3 hrs/week; Independent Study, **Assumed knowledge:** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5415
Multimedia Design and Authoring

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5114 or COMP9419. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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, communication and security. Specialist areas such as Picture Archiving and Communication Systems (PACS), computer-aided diagnosis (CAD), 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 Retrieval

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 retrieval techniques demanded by users to meet their information needs. This unit provides students with the most updated knowledge in order to address this issue in the context of big data, from the basics of textual information retrieval, to many advanced techniques in the field, such as large scale retrieval and social media.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

COMP5456
Introduction to Bioinformatics

This unit of study is not available in 2015

Credit points: 6 **Session:** Summer Main **Classes:** Laboratory 2 hrs/week; Lecture 2 hrs/week. **Prohibitions:** COMP3456 **Assumed knowledge:** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit brings together a wide range of skills 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. The unit covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research. It further 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.

ELEC5507
Error Control Coding

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files.You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

IDEA9106
Design Thinking

Credit points: 6 **Teacher/Coordinator:** Dr Lian Loke **Session:** Semester 1, Semester 2 **Classes:** Lecture 1hr/wk, Tutorial 2hrs/wk **Assessment:** Design assignments (90%), Participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an overview of a human (or user) centred approach to the design of interactive technologies. It introduces students to design thinking and how it can be productively applied to different design situations. The theoretical concepts, methods and tools for the key stages of interaction design are covered including user research, ideation, prototyping and user evaluation. The cognitive processes of individual designers are also explored. Students learn to persuasively communicate and pitch design concepts with an emphasis on the user experience through visual storytelling and the use of video. It provides students with the principles, processes and tools for working on user-centred design in studio projects. Students will acquire the following learning outcomes:

1. An appreciation of the role of design thinking in traditional and cross-disciplinary contexts

2. Theoretical and practical understanding and application of human-centred methodologies, methods and tools

3. Demonstration of ideation and concept development, informed by user and background research, to innovate interactive technology solutions to complex problems

4. Awareness of design processes and cognition in collaborative, inter-disciplinary teams

5. Demonstration of persuasive oral/visual communication techniques

INFO5010
IT Advanced Topic A

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Late **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

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 1, Semester 2, Winter Main **Classes:** One 2 hour scheduled small-group class per week. **Prohibitions:** INFO4011 **Assessment:** Through session assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

INFO5060
Data Analytics and Business Intelligence

Credit points: 6 **Session:** Summer Early **Classes:** Lecture 4 hrs; Tutorial 2 hrs; Laboratory 6 hrs; Presentation 3 hrs; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Block mode

The frontier for using data to make decisions has shifted dramatically. High performing enterprises are now building their competitive strategies around data-driven insights that in turn generate impressive business results. This course provides an overview of Business Intelligence (BI) concepts, technologies and practices, and then focuses on the application of BI through a team based project simulation that will allow students to have practical experience in building a BI solution based on a real world case study.

INFO5301
Information Security Management

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study gives a broad view of the management aspects of information security. We emphasise corporate governance for information security, organisational structures within which information security is managed, risk assessment, and control structures. Planning for security, and regulatory issues, are also addressed.

INFO5306
Enterprise Healthcare Info Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS). **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Healthcare systems intimately coupled to ICT have been at the forefront of many of the medical advances in modern society in the past decade. As is already the case in many other service-driven sectors, it is widely recognised that a key approach to solve some of the healthcare challenges is to harness and further ICT innovations. This unit is designed to help fill a massive technology talent gap where one of the biggest IT challenges in history is in the technology transformation of healthcare.

The unit will consist of weekly lectures, a set of group discussions (tutorials) and practical lab sessions. The contents will offer students the opportunity to develop IT knowledge and skills related to all aspects of Enterprise Healthcare Information Systems. Key Topics covered include:

* Health Information System e.g., Picture Archiving and Communication Systems (PACS) and Radiology IS

* Electronic Health Records / Personal Health Records

* Health data management

* Healthcare Transactions

* Health Statistics and Research

* Decision Support Systems including Image-based systems

* Cost Assessments and Ethics / Privacy

* TeleHealth / eHealth

* Cases studies with Australian Hospitals

Guest lecturers from the healthcare industry will be invited. The core of student's assessments will be based on individual research reports (topics related to the current industry IT needs), software / practical assignment and quizzes.

INFO6010
Advanced Topics in IT Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial (applied workshop) 1 hr/week; E-Learning 1 hr/week. **Prerequisites:** INFO6007, OR 3-5 years working experience in IT Project Management **Assumed knowledge:** Students are assumed to understand the role of IT projects. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the limitations of IT project management and the most promising techniques to overcome project failure. It will start by reviewing case study research showing we have reached the limits of traditional IT project management practice. The theoretical base will be completed by exploring the finding that senior management have more impact on success than traditional approaches.

Participants will be introduced to and learn to apply the most promising tools and techniques needed to govern IT projects. The topics reviewed will include:

1)strategy,

2)organisational change,

3)project sponsorship,

4)programme management,

5)performance measurement,

6)culture

7)portfolio management.

8)Relevant Australian and International Standards on IT/Project Governance and new industry methodologies around portfolio, programme and change management will be reviewed.

ISYS5050
Knowledge Management Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** An undergraduate degree in Computer

Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The need to track and facilitate the sharing of the core knowledge resources in contemporary organisations is widely recognised. This course will provide a comprehensive introduction to the emerging area of Knowledge Management (KM) from both technological and organisational perspectives. We will review and discuss a range of published papers, case studies, and other publications that deal with a range of important KM-related topics. One of the key knowledge management technologies, Business Intelligence Systems, will be covered in detail. It will also include hands-on work using the BI (Online Analytical Processing - OLAP) tool, COGNOS.

Some of the main themes to be covered will include:

oKM: Conceptual Foundations

oTaxonomies of organizational knowledge and KM mechanisms

oCase/Field Studies of KM Initiatives

o Data Warehousing and OLAP/Business Analytics

oData, text, and web mining.

oSocial media,crowdsourcing, an KM

PUBH5010
Epidemiology Methods and Uses

Credit points: 6 **Teacher/Coordinator:** Professor Tim Driscoll **Session:** Semester 1 **Classes:** 1x 1hr lecture and 1x 2hr tutorial per week for 13 weeks - lectures and tutorials may be completed online **Prohibitions:** BSTA5011 **Assessment:** 1x 4page assignment (30%) and 1x 2.5hr supervised open-book exam (70%). For distance students, it may be possible to complete the exam externally with the approval of the course coordinator. **Mode of delivery:** Online

This unit provides students with core skills in epidemiology, particularly the ability to critically appraise public health and clinical epidemiological research literature. This unit covers: study types; measures of frequency and association; measurement bias; confounding/effect modification; randomized trials; systematic reviews; screening and test evaluation; infectious disease outbreaks; measuring public health impact and use and interpretation of population health data. It is expected that students spend an additional 2-3 hours at least preparing for their tutorials.

Textbooks

Webb, PW. Bain, CJ. and Pirozzo, SL. Essential Epidemiology: An Introduction for Students and Health Professionals Second Edition: Cambridge University Press 2011.

STAT5003
Computational Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Shelton Peiris **Session:** Semester 2 **Classes:** Two lectures and one tutorial per week. **Prerequisites:** STAT5002 **Assessment:** 2 hour examination (60%), assignments (20%), quizzes (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: Department permission required for enrolment.

The objectives of this unit of study are to develop an understanding of modern computationally intensive methods for statistical inference, exploratory data analysis and data mining. Advanced computational methods for statistics will be introduced, including univariate, multivariate and combinatorial optimisation methods and simulation methods, such as Gibbs sampling, the Bootstrap, Monte Carlo and the Jackknife approach. In addition, the unit will demonstrate how to apply the above techniques effectively for use on large data sets in practice. Finally, this unit will show how to make inferences about populations of interest in data mining problems.

Textbooks

Computational Statistics, Geof H. Givens, Jennifer A. Hoeting, Wiley (2005)

Elective units

COMP5705
Information Technology Short Project

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Late, Winter Main **Classes:** Meeting 1 hr/week; Project Work - own time, **Prohibitions:** COMP5704, COMP5703, COMP5702 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Specialist/Elective/Project

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's 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 **Prohibitions:** COMP5702, COMP5703, COMP5704 **Mode of delivery:** Supervision

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 gets split over both semester 1 and semester 2.

INFO5301
Information Security Management

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study gives a broad view of the management aspects of information security. We emphasise corporate governance for information security, organisational structures within which information security is managed, risk assessment, and control structures. Planning for security, and regulatory issues, are also addressed.

INFO5991
Services Science Management and Eng

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Seminar 2 hrs/week. **Assumed knowledge:** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The service economy plays a dominant and growing role in growth and employment in most parts of the world. Increasingly, the improved productivity and competitive performance of firms and nations in the services arena relies on innovative and effective design, engineering and management of IT-centric services. In response to industry needs, this unit offers IT professionals a social, economic and technical perspective of service-oriented IT.

INFO6012
Information Technology Strategy & Value

Credit points: 6 **Session:** Semester 2 **Classes:** Flexible Session 3 hrs/week. **Assumed knowledge:** COMP5206. Introduction to Information Systems **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The increasingly strategic role of IT in organisations is widely recognised. This unit of study is designed to provide a comprehensive introduction to strategic aspects of IT as they impact on business value. Such a perspective is critical for IT professionals in both IT producer and user organisations from the level of Chief Information Officer to managers as well as technical specialists. Deep understanding of IT strategy formulation and implementation and ensuring its alignment with the organisation's strategic directions is important for successfully managing the major changes that the IT function has undergone in recent years.

Topics covered will include technology forecasting and assessment of IT impacts, achieving sustainable competitive through IT, relationship between IT strategy and value, IT strategy formulation and implementation, evaluation of strategic investments in IT, IT portfolio management, IT souring and open innovation, and dynamics of IT strategy and game theory. It will explore IT-related strategic decision making at the different organisational levels and the concept of strategic congruence. This unit will provide students with models, tools, and techniques to evaluate an organisation's IT strategic position, and hence to help make appropriate strategic choices.

INFS6012
Enterprise Systems Management

Credit points: 6 **Teacher/Coordinator:** Jenny Leonard **Session:** Semester 1 **Classes:** 1x 3hr seminar per week **Assessment:** mid-semester test (35%), individual enterprise system portfolio (35%), and group report (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a defined elective unit of study in both the Master of Professional Accounting and the Master of Commerce programs.

This unit explores the strategic managerial issues that arise from the implementation and use of Enterprise Systems as a means of integrating data and standardising processes. The unit utilises a combination of practical sessions with an Enterprise System, such as SAP, and analyses based on readings of case studies to explore the long-term effects of strategic implementation decisions, and issues with regard to Enterprise System implementation projects. The unit explores the emergence and implications of cloud-based Enterprise Systems, and the part that Enterprise Systems play in an organisation's broader information infrastructure.

INFS6015
Business Process Management

Credit points: 6 **Teacher/Coordinator:** Olivera Marjanovic **Session:** Semester 2 **Classes:** 1x 3hr seminar per week **Assessment:** individual assignment (35%), group assignment (25%), and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an overview of the business process architecture and life cycle from a management perspective. It provides a detailed understanding of the concepts, strategies, tools and technologies required for modelling, analysis, design, improvement, integration, performance measurement and governance of business processes (both intra- and inter-enterprise) in any organisational and/or value chain context and relevant industry standards. The unit also develops practical skills in modelling, redesigning and improving business processes using various business process management software tools/suites.

INFS6016
Technology Enabled Business Innovation

Credit points: 6 **Teacher/Coordinator:** TBA **Session:** Semester 2 **Classes:** 1 x 3hr seminar per week **Assumed knowledge:** Understanding the major functions of a business and how those business functions interact internally and externally so the company can be competitive in the market is essential in order to critically analyse how and where a business can be innovative. Some knowledge of how technology can be applied in a business is also essential. Experience as a member of a project team is desirable. **Assessment:** individual research assignment (15%), individual problem-based assignment (35%), and group problem-based assignment (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit develops knowledge and skills in innovative, technology-enabled business models and strategies from a management perspective. The unit facilitates a better understanding and application of the concepts, strategies, tools and technologies necessary for undertaking business innovation. From basic knowledge of business models and essential business processes, this unit increases awareness and understanding of stakeholders, their capabilities and their limitations in the strategic convergence of technology and business. It provides insights into the technology and infrastructure required to support commerce in the 21st Century and supports development of student capabilities to analyse, develop and evaluate innovative technology-enabled business strategies and models.

INFS6018
Managing Business Intelligence

Credit points: 6 **Teacher/Coordinator:** Olivera Marjanovic **Session:** Semester 1 **Classes:** 1 x 3hr seminar per week **Assessment:** tutorial work (10%), mid-session exam (30%), practical assignment (20%), and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Business Intelligence (BI), increasingly known as Business Analytics, is a major source of competitive advantage in the Information Age and is therefore a leading business priority globally. In recent times, this field has evolved from a technology topic to a management priority, creating an unprecedented demand for new management skills. Taking a business rather than technology perspective, this unit covers all aspects of the enterprise BI ecosystem in the context of strategic and operational BI, including all five stages of BI evolution. Topics include assessment and management of organisational data quality, multidimensional data modelling and integration, management of structured and unstructured data (including those created by social media), business aspects of data warehousing, innovation through advanced analytics, BI driven performance management, business process intelligence, active enterprise intelligence, and management of complex BI projects. Access is provided to the largest world-wide community of BI academics and industry practitioners called TUN (www.TeradataUniversityNetwork.com). The hands-on experience in using a commercial BI platform, combined with in-depth analytical skills, will enable students completing the unit to help any organization (regardless of its size and industry domain) to derive more intelligence from its data and compete on analytics. This unit does not require programming experience; it is suitable for both current and aspiring BI practitioners as well as general business practitioners from any functional area interested to learn how to start and lead BI-related initiatives.

ISYS5070
Change Management in IT

Credit points: 6 **Session:** Winter Main **Classes:** Lecture 6 hrs/week; Tutorial 6 hrs/week; Presentation 3 hrs/week; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after the following related units INFO6007 Project Managemnet in IT and COMP5206 Introduction to Information Systems. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Block mode

This unit of study presents the leading edge of research and practice in change management and focuses on theories, frameworks and perspectives that can guide your work as a change agent in the IT industries. The unit will cover a range of approaches, methods, interventions and tools that can be used to successfully manage change projects that relate to the implementation of new technologies.

The globalisation of markets and industries, accelerating technological innovations and the need of companies to remain at the forefront of technological developments in an increasingly competitive, globalised industry have resulted in a significant increase in the speed, magnitude, and unpredictability of technological and organisational change over the last decades. Companies who have the competencies required to navigate change and overcome the inevitable obstacles to success gain a much-needed competitive edge in the marketplace. Increased globalization, economic rationalism, environmental dynamics and technological changes mean that companies, more than ever before, need to be highly flexible and adaptable to survive and thrive. Yet, a large percentage of IT projects fail to achieve the intended objectives, go over time or over budget. The capability to successfully manage organisational and technological change has become a core competency for IT professionals, business leaders and project managers.

This unit has been specifically developed for IT professionals, project managers, and senior managers to equip them with the knowledge and tools needed to ensure that IT projects remain on track to achieving the intended objectives on time and on budget. The course presents the key theories, concepts and findings in the context of academic research and change management practice. The objective is to allow participants to critically assess academic theories and methodological practice and devise interventions and actions that allow the successful management of IT initiatives.

Foundation units

Candidates for the Master of Information Technology and the Graduate Certificate in Information Technology take a maximum of 12 credit points of Foundation units of study.

COMP5116
Design of Networks & Distributed Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit covers general foundations of communication systems and a detailed walk through of the implementation of the TCP/IP protocol stack, which forms the basis of the Internet. The unit also covers the basic knowledge of how to analyse, design and implement simple communication protocols.

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 and design.

COMP5213
Computer and Network Organisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to computer organisation and network protocols. It covers a broad range of topics including computer hardware, software architecture (operating systems, compilers, etc), and principles of communication network protocols. It is designed to give students an understanding of how software programs operate and run inside the computer hardware, and therefore the knowledge how to use computers most effectively.

COMP9007
Algorithms

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour lectures and one 1 hour tutorial per week. **Prohibitions:** COMP5211 **Assumed knowledge:** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 computational thinking from simple list manipulation and data format conversion, up to shortest paths and cycle detection in graphs. Students will gain essential knowledge in computer science, including basic concepts in data structures, algorithms, and intractability, using paradigms such as dynamic programming, divide and conquer, greed, local search, and randomisation, as well NP-hardness.

COMP9103
Software Development in Java

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 1 hours per week **Prohibitions:** COMP5214 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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. Students will be progressively guided in 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.

COMP9110
System Analysis and Modelling

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Tutorial: 1 hours per week **Prohibitions:** : ELEC3610 OR ELEC5743 OR INFO2110 OR INFO5001 **Assumed knowledge:** Experience with a data model as in COMP9129 or COMP9103 or INFO9220 or INFO9120 or COMP5212 or COMP5214 or COMP5028 or COMP5138 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 on-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. Note: The lectures of this unit are co-taught with INFO2110.

COMP9120
Database Management Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 2 hour tutorial per week. **Prohibitions:** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content. **Assumed knowledge:** Some exposure to programming and some familiarity with data model concepts **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

Note that the first two thirds of the lectures of this foundational unit will be co-taught with the corresponding undergraduate class in semester 1 (INFO2120); tutorials and assignments will be organised separately.

COMP9220
Object-Oriented Design

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** : COMP5028 OR INFO3220 **Assumed knowledge:** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces essential object-oriented design methods and language mechanisms, especially the principles of modelling through Rational Unified Process and agile processes using Unified Modeling

Language (UML) and Java or C++, both of which are industry standard. Students work in small groups to experience the process of object-oriented analysis, object-oriented design, implementation and testing by building a real-world application. Java or C++ is used as the implementation language and a special emphasis is placed on those features of Java or C++ that are important for solving real-world problems. Advanced software engineering features, including exceptions and name spaces are thoroughly covered.

COMP9419
Digital Media Fundamentals

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** COMP5114 **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Digital media has become indispensable our heterogeneous computing and communication environment. This unit provides an overview of creating, processing, manipulating, and compressing 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 such as web media.

INFO9003
IT for Health Professionals

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 6 hours per week; Laboratory: 6 hours per week **Prohibitions:** INFO5003 **Assessment:** Through-semester assessment (50%), Final Exam (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment.

Information technologies (IT) and systems have emerged as the primary platform to support communication, collaboration, research, decision making, and problem solving in contemporary health organisations. The essential necessity for students to acquire the fundamental knowledge and skills for applying IT effectively for a wide range of tasks is widely recognised. This is an introductory unit of study which prepares students in the Health 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 health 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. Students will undertake practical tasks including scripting languages and building a small scale application for managing information. In addition, the course will address the issues arising from the wide-spread use of information technology in a variety of Health area.

INFO9117
Intro to Software Engineering Practice

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hour per week; Tutorial 2 hours per week. **Assumed knowledge:** Skill as an individual programmer (as expected from any IT graduate, who could be admitted to GCertIT, GDipIT or MIT degree) **Assessment:** Through semester assessment (50%), Final Exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is an elective for students in the postgraduate IT degrees. It is expected to be taken early in the degree if (and only if) their undergraduate education and subsequent experience have not covered this vital aspect, namely working in groups under a defined process to deliver a software development project. Remark: the USyd undergraduate degrees in IT and in SE all cover this material, especially through the unit COMP3615 or INFO3600 and INFO3402; however, not all institutions guarantee this sort of experience for IT graduates. This unit will scaffold such students to do well in future group development projects, in their coursework or in industry, by providing fundamental knowledge of Software Engineering processes and practices. Much of the student's effort will be directed towards a carefully managed small-group project to deliver a software system to meet a client's needs; they will be working with a client who may be external, or who may be a member of the teaching staff role-playing as an external client. A member of the teaching staff (separate from anyone who is acting as client) will take the role of manager for the group, checking progress and providing feedback frequently. By the end of the unit, the students will understand the processes and practices used in group projects that develop software, and they will be able to follow these processes and practices, so that they can contribute effectively in a small group that is developing software to meet clients needs.

PUBH5018
Introductory Biostatistics

Credit points: 6 **Teacher/Coordinator:** Dr Kevin McGeechan and Dr Patrick Kelly **Session:** Semester 1 **Classes:** 2 x 2hr lecture, 10 x 1hr lectures, 11 x 2hr tutorials, 2 x 1hr and 8 x 0.5hr statistical computing self directed learning tasks over 12 weeks - lectures and tutorials may be completed online **Assessment:** 1x4 page assignment (30%) and 1x2.5hr open-book exam (70%). For distance students it may be possible to complete the exam externally with the approval of the course coordinator. **Mode of delivery:** Normal (lecture/lab/tutorial) evening

This unit aims to provide students with an introduction to statistical concepts, their use and relevance in public health. This unit covers descriptive analyses to summarise and display data; concepts underlying statistical inference; basic statistical methods for the analysis of continuous and binary data; and statistical aspects of study design. Specific topics include: sampling; probability distributions; sampling distribution of the mean; confidence interval and significance tests for one-sample, two paired samples and two independent samples for continuous data and also binary data; correlation and simple linear regression; distribution-free methods for two paired samples, two independent samples and correlation; power and sample size estimation for simple studies; statistical aspects of study design and analysis. Students will be required to perform analyses using a calculator and will also be required to conduct analyses using statistical software (SPSS). It is expected that students spend an additional 2 hours per week preparing for their tutorials. Computing tasks are self-directed.

Textbooks

Course notes are provided.

STAT5002
Introduction to Statistics

Credit points: 6 **Teacher/Coordinator:** A/Prof Shelton Peiris **Session:** Semester 1 **Classes:** Two lectures and one tutorial per week. **Assumed knowledge:** HSC Mathematics **Assessment:** 2 hour examination (60%), assignments (20%), quizzes (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

The aim of the unit is to introduce students to basic statistical concepts and methods for further studies. Particular attention will be paid to the development of methodologies related to statistical data analysis and Data Mining. A number of useful statistical models will be discussed and computer oriented estimation procedures will be developed. Smoothing and nonparametric concepts for the analysis of large data sets will also be discussed. Students will be exposed to the R computing language to handle all relevant computational aspects in the course.

Textbooks

All of Statistics, Larry Wasserman, Springer (2004)

Professional Pathway Project units

24 credit points of Core, Specialist or Foundation units must be completed with at least Credit average marks before enrolling in any Project units of study.The minimum requirement for the Professional Practice pathway is 12 credit points of Information Technology Capstone project units. These can be taken as COMP5707 and COMP5708 over two semesters, or as COMP5703 in one semester.

COMP5703
Information Technology Project

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 18 hours; Meeting 1 hour. **Prerequisites:** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. **Prohibitions:** : COMP5702 OR COMP5704 OR COMP5707 OR COMP5708 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

COMP5707
Information Technology Capstone A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research/Project Work 9 hrs per week; Meeting 1 hr per week. **Prohibitions:** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report. It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

COMP5708
Information Technology Capstone B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research/Project Work 9 hours per week; Meeting 1 hour per week. **Corequisites:** Corequisite: COMP5707 **Prohibitions:** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report. It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

Research Pathway units

Candidates who achieve Distinction (75%) average results or above over the first 24 credit points may gain admission to the Research pathway, subject to the approval of the Program Director.Candidates who pursue the Research path take INFO5993 instead of INFO5990.

COMP5702
IT Research Project A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 22 hrs/week; Meeting 2 hrs/week. **Prohibitions:** : COMP5707 OR COMP5708 OR COMP5703. **Assumed knowledge:** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Research Project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to define an original research project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent research work in a setting and manner that fosters the development of IT skills in research.

COMP5704
IT Research Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 22 hours; Meeting 2 h ours. **Prerequisites:** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take this unit. **Prohibitions:** : COMP5707 OR COMP5708 OR COMP5703. Students enrolling (and eligible) for the IT Research Project are not eligible to enrol in the IT Capstone Project Units. **Assumed knowledge:** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Research Project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to define an original research project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent research work in a setting and manner that fosters the development of IT skills in research.

INFO5993
IT Research Methods

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

Majors for the Master of Information Technology

A major requires the completion of all core units of study as prescribed for this degree and at least 18 credit points chosen from the Specialist units of study listed in the tables below for the defined majors.

Biomedical and Health Informatics

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5206
Information Technologies and Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive introduction to the field of information systems from organisational and managerial perspectives. The emergence of the digital firm and its implications will be studied. The critical role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Key topics covered will include:

*Basic Information Systems Concepts

*Systems Approach and Systems Thinking

*E-Business and E-Commerce

*IT Strategy and Competitive Advantage

*Data and Knowledge Management

*Information Systems Development and IS Management

*Decision support systems, business intelligence and online analytical processing systems (OLAP)

*Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems, Enterprise Content Management and Supply Chain Management (SCM) systems

*Ethical, Legal and Social Aspects of Information technologis.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5424
Information Technology in Biomedicine

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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, communication and security. Specialist areas such as Picture Archiving and Communication Systems (PACS), computer-aided diagnosis (CAD), 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.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

COMP5456
Introduction to Bioinformatics

This unit of study is not available in 2015

Credit points: 6 **Session:** Summer Main **Classes:** Laboratory 2 hrs/week; Lecture 2 hrs/week. **Prohibitions:** COMP3456 **Assumed knowledge:** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit brings together a wide range of skills 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. The unit covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research. It further 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.

INFO5306
Enterprise Healthcare Info Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS). **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Healthcare systems intimately coupled to ICT have been at the forefront of many of the medical advances in modern society in the past decade. As is already the case in many other service-driven sectors, it is widely recognised that a key approach to solve some of the healthcare challenges is to harness and further ICT innovations. This unit is designed to help fill a massive technology talent gap where one of the biggest IT challenges in history is in the technology transformation of healthcare.

The unit will consist of weekly lectures, a set of group discussions (tutorials) and practical lab sessions. The contents will offer students the opportunity to develop IT knowledge and skills related to all aspects of Enterprise Healthcare Information Systems. Key Topics covered include:

* Health Information System e.g., Picture Archiving and Communication Systems (PACS) and Radiology IS
* Electronic Health Records / Personal Health Records
* Health data management
* Healthcare Transactions
* Health Statistics and Research
* Decision Support Systems including Image-based systems
* Cost Assessments and Ethics / Privacy
* TeleHealth / eHealth
* Cases studies with Australian Hospitals

Guest lecturers from the healthcare industry will be invited. The core of student's assessments will be based on individual research reports (topics related to the current industry IT needs), software / practical assignment and quizzes.

PUBH5010
Epidemiology Methods and Uses

Credit points: 6 **Teacher/Coordinator:** Professor Tim Driscoll **Session:** Semester 1 **Classes:** 1x 1hr lecture and 1x 2hr tutorial per week for 13 weeks - lectures and tutorials may be completed online **Prohibitions:** BSTA5011 **Assessment:** 1x 4page assignment (30%) and 1x 2.5hr supervised open-book exam (70%). For distance students, it may be possible to complete the exam externally with the approval of the course coordinator. **Mode of delivery:** Online

This unit provides students with core skills in epidemiology, particularly the ability to critically appraise public health and clinical epidemiological research literature. This unit covers: study types; measures of frequency and association; measurement bias; confounding/effect modification; randomized trials; systematic reviews; screening and test evaluation; infectious disease outbreaks; measuring public health impact and use and interpretation of population health data. It is expected that students spend an additional 2-3 hours at least preparing for their tutorials.

Textbooks

Webb, PW. Bain, CJ. and Pirozzo, SL. Essential Epidemiology: An Introduction for Students and Health Professionals Second Edition: Cambridge University Press 2011.

Data Management and Analytics

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5048
Visual Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Visual Analytics aims to facilitate the data analytics process through Information Visualisation. Information Visualisation aims 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 challenge for Visual Analytics is to design and implement "effective Visualisation methods that produce pictorial representation of complex data so that data analysts from various fields (bioinformatics, social network, software visualisation and network) can visually inspect complex data and carry out critical decision making.

This unit will provide basic HCI concepts, Visualisaiton 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 Visual Analytic methods.

COMP5318
Knowledge Discovery and Data Mining

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** INFO9120 OR COMP5138 **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 for data, by automatic and 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

COMP5338
Advanced Data Models

Credit points: 6 **Session:** Semester 2 **Classes:** Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1). **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 data storage technology.

Particular emphasis is put on spatial, temporal, and NoSQL data storage. This unit extensively covers the advanced features of SQL:2003, as well as a few dominant NoSQL storage technologies. Besides in lectures, the advanced topics will be also studied with prescribed readings of database research publications.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5425
Multimedia Retrieval

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 retrieval techniques demanded by users to meet their information needs. This unit provides students with the most updated knowledge in order to address this issue in the context of big data, from the basics of textual information retrieval, to many advanced techniques in the field, such as large scale retrieval and social media.

INFO5060
Data Analytics and Business Intelligence

Credit points: 6 **Session:** Summer Early **Classes:** Lecture 4 hrs; Tutorial 2 hrs; Laboratory 6 hrs; Presentation 3 hrs; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Block mode

The frontier for using data to make decisions has shifted dramatically. High performing enterprises are now building their competitive strategies around data-driven insights that in turn generate impressive business results. This course provides an overview of Business Intelligence (BI) concepts, technologies and practices, and then focuses on the application of BI through a team based project simulation that will allow students to have practical experience in building a BI solution based on a real world case study.

ISYS5050
Knowledge Management Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The need to track and facilitate the sharing of the core knowledge resources in contemporary organisations is widely recognised. This course will provide a comprehensive introduction to the emerging area of Knowledge Management (KM) from both technological and organisational perspectives. We will review and discuss a range of published papers, case studies, and other publications that deal with a range of important KM-related topics. One of the key knowledge management technologies, Business Intelligence Systems, will be covered in detail. It will also include hands-on work using the BI (Online Analytical Processing - OLAP) tool, COGNOS.

Some of the main themes to be covered will include:

oKM: Conceptual Foundations

oTaxonomies of organizational knowledge and KM mechanisms

oCase/Field Studies of KM Initiatives

o Data Warehousing and OLAP/Business Analytics

oData, text, and web mining.

oSocial media,crowdsourcing, an KM

STAT5003
Computational Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Shelton Peiris **Session:** Semester 2 **Classes:** Two lectures and one tutorial per week. **Prerequisites:** STAT5002 **Assessment:** 2 hour examination (60%), assignments (20%), quizzes (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: Department permission required for enrolment.

The objectives of this unit of study are to develop an understanding of modern computationally intensive methods for statistical inference, exploratory data analysis and data mining. Advanced computational methods for statistics will be introduced, including univariate, multivariate and combinatorial optimisation methods and simulation methods, such as Gibbs sampling, the Bootstrap, Monte Carlo and the Jackknife approach. In addition, the unit will demonstrate how to apply the above techniques effectively for use on large data sets in practice. Finally, this unit will show how to make inferences about populations of interest in data mining problems.

Textbooks

Computational Statistics, Geof H. Givens, Jennifer A. Hoeting, Wiley (2005)

Digital Media Technology

CISS6022
Cybersecurity

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week **Assessment:** 1x2hr exam (40%), 1x3000wd analytical Essay (40%), 1x1000wd equivalent lab exercise (10%), 1xSeminar participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The digital revolution has created new frontiers of information that influence almost every aspect of our lives. But does cyberspace also threaten our security? What are the methods and motives for attack? And how can state and non-state actors respond? Drawing on a unique combination of expertise from the Centre for International Security Studies and the School of Information Technologies, this unit introduces students to the technical and political concepts that are necessary to answer these important questions.

COMP5045
Computational Geometry

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - in class 12 hrs/week. **Assumed knowledge:** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees. **Assessment:** Through semester assessment (80%) Final Exam (20%) **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 geometric 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.

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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
Visual Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Visual Analytics aims to facilitate the data analytics process through Information Visualisation. Information Visualisation aims 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 challenge for Visual Analytics is to design and implement "effective Visualisation methods that produce pictorial representation of complex data so that data analysts from various fields (bioinformatics, social network, software visualisation and network) can visually inspect complex data and carry out critical decision making.

This unit will provide basic HCI concepts, Visualisaiton 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 Visual Analytic methods.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5347
Web Application Development

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week; Project Work - own time 3 hrs/week; Independent Study, **Assumed knowledge:** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5415
Multimedia Design and Authoring

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5114 or COMP9419. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5425
Multimedia Retrieval

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 retrieval techniques demanded by users to meet their information needs. This unit provides students with the most updated knowledge in order to address this issue in the context of big data, from the basics of textual information retrieval, to many advanced techniques in the field, such as large scale retrieval and social media.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

IDEA9106
Design Thinking

Credit points: 6 **Teacher/Coordinator:** Dr Lian Loke **Session:** Semester 1, Semester 2 **Classes:** Lecture 1hr/wk, Tutorial 2hrs/wk **Assessment:** Design assignments (90%), Participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an overview of a human (or user) centred approach to the design of interactive technologies. It introduces students to design thinking and how it can be productively applied to different design situations. The theoretical concepts, methods and tools for the key stages of interaction design are covered including user research, ideation, prototyping and user evaluation. The cognitive processes of individual designers are also explored. Students learn to persuasively communicate and pitch design concepts with an emphasis on the user experience through visual storytelling and the use of video. It provides students with the principles, processes and tools for working on user-centred design in studio projects. Students will acquire the following learning outcomes:

1. An appreciation of the role of design thinking in traditional and cross-disciplinary contexts
2. Theoretical and practical understanding and application of human-centred methodologies, methods and tools
3. Demonstration of ideation and concept development, informed by user and background research, to innovate interactive technology solutions to complex problems
4. Awareness of design processes and cognition in collaborative, inter-disciplinary teams
5. Demonstration of persuasive oral/visual communication techniques

Networks and Distributed Systems

CISS6022
Cybersecurity

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week **Assessment:** 1x2hr exam (40%), 1x3000wd analytical Essay (40%), 1x1000wd equivalent lab exercise (10%), 1xSeminar participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The digital revolution has created new frontiers of information that influence almost every aspect of our lives. But does cyberspace also threaten our security? What are the methods and motives for attack? And how can state and non-state actors respond? Drawing on a unique combination of expertise from the Centre for International Security Studies and the School of Information Technologies, this unit introduces students to the technical and political concepts that are necessary to answer these important questions.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5313
Large Scale Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The growing connectedness of modern society translates into simplifying global communication and accelerating spread of news, information and epidemics. The focus of this unit is on the key concepts to address the challenges induced by the recent scale shift of complex networks. In particular, the course will present how scalable solutions exploiting graph theory, sociology, game theory and probability tackle the problems of communicating (routing, diffusing, aggregating) in dynamic and social networks.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5416
Advanced Network Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

ELEC5509
Mobile Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

ELEC5616
Computer and Network Security

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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.

Software Engineering

CISS6022
Cybersecurity

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week **Assessment:** 1x2hr exam (40%), 1x3000wd analytical Essay (40%), 1x1000wd equivalent lab exercise (10%), 1xSeminar participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The digital revolution has created new frontiers of information that influence almost every aspect of our lives. But does cyberspace also threaten our security? What are the methods and motives for attack? And how can state and non-state actors respond? Drawing on a unique combination of expertise from the Centre for International Security Studies and the School of Information Technologies, this unit introduces students to the technical and political concepts that are necessary to answer these important questions.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5347
Web Application Development

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week; Project Work - own time 3 hrs/week; Independent Study, **Assumed knowledge:** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

ELEC5616
Computer and Network Security

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

Telecommunications Engineering

COMP5416
Advanced Network Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

ELEC5507
Error Control Coding

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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.

For more information on units of study visit CUSP.

Master of Information Technology Management

Course overview

The Master of Information Technology Management prepares you for transition into management. It equips you with an in-depth understanding of key areas including business analytics and intelligence, IT services, management of IT innovations and change management.

While a background in computing skills is assumed, the emphasis is not on developing technical skills. The focus of the program is on providing a thorough and detailed understanding of the management of resources such as projects, people, knowledge and technologies.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Course structure

You will study a selection of subjects covering a core set of IT management topics.

You will also have the opportunity to select from a number of elective topics in order to add depth or breadth to your studies.

Accreditation

The MITM has been developed under the guidelines of the Australian Computer Society (ACS), and has been accredited by the society as a Professional Level course in information technology.

Information Technology Management

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
GCINFTMG-02	Graduate Certificate in Information Technology Management
GNINFTMG-02	Graduate Diploma in Information Technology Management
MAINFTMG-02	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 Technology Management requires:
(a) a bachelor's degree or higher award in Information Technology or Information Systems from the University of Sydney, or qualifications deemed by the School of IT to be equivalent in any aspect of Information Technology; or
(b) a Bachelor's degree or higher award in Engineering from the University of Sydney with a major sequence of study in Computing Engineering, Software Engineering, or Telecommunications Engineering, or qualifications deemed by the School of IT to be equivalent; or
(c) a bachelor's degree or higher award in any discipline from the University of Sydney and a minimum of two years' professional experience in the IT industry, or qualifications deemed by the School of IT to be equivalent.
(3) Admission to the Graduate Diploma in Information Technology Management requires:
(a) a Bachelor's degree or higher award in Information Technology or Information Systems from the University of Sydney with at least a credit average, or qualifications deemed by the School of IT to be equivalent in any aspect of Information Technology;
(b) a bachelor's degree or higher award in Engineering from the University of Sydney with at least a credit average and a major sequence of study in Computing Engineering, Software Engineering, or Telecommunications Engineering, or qualifications deemed by the School of IT to be equivalent: or
(c) a bachelor's degree or higher award in any discipline from the University of Sydney with at least a credit average and a minimum of two years' professional experience in the IT industry, or qualifications deemed by the School of IT to be equivalent: or
(d) completion of the requirements of the embedded Graduate Certificate in this discipline with at least a credit average.
(4) Admission to the Master of Information Technology Management requires:
(a) a bachelor's degree or higher award in Information Technology or Information Systems from the University of Sydney with at least a credit average, or qualifications deemed by the School of IT to be equivalent in any aspect of Information Technology; or
(b) a bachelor's degree or higher award in Engineering from the University of Sydney with at least a credit average and a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering, or qualifications deemed by the School of IT to be equivalent; or
(c) a bachelor's degree or higher award in any discipline from the ~~Unviersity~~ University of Sydney with at least a credit average and a minimum of two years' professional experience in the IT industry, or qualifications deemed by the School of IT to be equivalent; or
(d) completion of the requirements of the embedded Graduate Diploma or Graduate Certificate in this discipline with at least a credit average; or
(e) completion of the Graduate Diploma in Computing from the University of Sydney with at least a credit average ~~with no more than 12 credit points of unit of study failed~~.
(5) In exceptional circumstances the Dean or nominee may admit applicants without these qualifications who, in the opinion of the School of IT, have qualifications and evidence of experience and achievement sufficient to successfully undertake the award.
(6) If a candidate does not have the equivalent qualification with a credit average, they may be admitted to the ~~Graduate Diploma or~~ Graduate Certificate subject to the discretion of the Dean or nominee.

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 Academic Director:

(a) Master of Information Technology Management: a ~~amximum~~maximum of 12 credit points may be selected from units outside the School of IT (i.e. outside of COMP, INFO and ISYS coded units).

(b) Graduate Certificate or Graduate Diploma in Information Technology Management: a maximum of 6 credit points may be selected from units of study outside the School of IT (i.e. outside of COMP, INFO and ISYS coded units).

(3) To qualify for the award of the Graduate Certificate in Information Technology Management a candidate must complete 24 credit points including:

(a) a minimum of 6 credit points of the Core units of study (including INFO5990); and

(b) a minimum of 6 credit points of the Specialist units of study from the table of units of study excluding Project units; and

(c) a maximum of 12 credit points of the Foundation units of study.

(4) To qualify for the award of the Graduate Diploma in Information Technology Management a candidate must complete ~~36~~48 credit points including:

(a) a minimum of 6 credit points of the Core units of study (including INFO5990); 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

(c) a maximum of 12 credit points of the Foundation units of study.

(5) To qualify for the award of the Master of Information Technology Management a candidate must complete 72 credit points of units of study as specified in the degree table including:

(a) for the Professional Pathway:

(I) 18 credit points of the C~~c~~ore units of study; and

(II) a minimum of 18 credit points of the Specialist units of study; and

(III) a minimum of 12 credit points of the Professional Pathway Project units of study; and

(IV) a maximum of 12 credit points of the Foundation units of study; and

(V) no credit points from the Research Pathway units of study.

(b) for the Research Pathway:

(I)

(II) a minimum of 12 credit points of the Specialist units of study; and

(III) a minimum of 24 credit points of the Research Pathway units of study; and

(IV) a maximum of 12 credit points of the Foundation units of study; and

(V) no credit points from the Professional Pathway Project units of study.

(c) If a reduction in the volume of learning is given then the candidate is able to apply for an exemption on some course requirements, if evidence can be provided of prior learning (subject to assessment by the Academic Director). The candidate will then be required to complete the required volume of learning based on the remaining course requirements.

7 Progression rules

(1) A candidate for the Master of Information Technology Management must complete 24 credit points from Core, Specialist, or Foundation units of study 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 from Core, Specialist or Foundation units of study with at least Distinction average marks may take Research Path units.

8 Suspension of Candidature

A student may seek written permission from the Dean~~m~~ to suspend candidature in the course. Suspension may be granted for a maximum of one year.

9 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.

10 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.

11 Credit for previous study (for non-conferred qualifications only)

(1) The following Coursework Rules (for non-conferred qualifications) replace the Faculty Coursework Rules for "Credit for previous study"; within the "Resolutions of the Faculty (of Engineering and Information Technologies)" for the Master of Information Technology Management:

(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 or Master of Information Technology ~~or the Graduate Diploma in Computing~~ and no award has been conferred, credit may be transferred in full (subject to credit limits in the table of units of study: Master of Information Technology Management), provided the study has been undertaken within the previous three years and subject to approval of the Academic Director. In addition, a credit transfer for the purposes of a course upgrade will require either:

(I) fulfilment of the admission requirements for the "Admission to Candidature" for the Master of Information Technology Management including at least a credit average from the prior qualification used for admission;

(II) completion of a minimum of 24 credit points of the currently enrolled course with at least a credit average;

(b)

(I) credit may not be transferred from the first 24 credit points of study of the Graduate Diploma in Computing;

(II) credit after the first 24 credit points in the Graduate Diploma in Computing may be transferred in full (subject to the credit limits in the table of units of study: Master of Information Technology Management);

(III) the study has been undertaken within the previous three years;

(IV) no award has been conferred.

(c) Where study not covered by (a) or (b) above 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 or Specialist units of study offered under the degree being taken, subject to approval of the Academic Director.

(d) Credit will not be granted for recognized prior learning older than 10 years at the time of first enrolment.

12 Recognition for Prior Learning (for conferred qualifications only)

(1) The following Coursework Rules (for conferred qualifications) replace the Faculty Coursework Rules for "Credit for previous study" within the "Resolutions of the Faculty (of Engineering and Information Technologies)" for the Master of Information Technology Management:

(a) where study has been undertaken and an award has been conferred, candidates who are offered direct admission to the Master of Information Technology Management may be eligible for a reduction in the volume of learning of up to 36 credit points provided that study for the conferred award has been undertaken at an external institution recognized by the University of Sydney, within the previous three years. Any reduction in the volume of learning is subject to the following guidelines and requires the approval of the Academic Director:

(I) the maximum permissible reduction in the volume of learning is 36 credit points for a master's degree (at Level 9 of the Australian Qualifications Framework) in the discipline of Information Technology, as defined by the School of IT.

(II) the maximum permissible reduction in the volume of learning is 24 credit points ofr a bachelor's degree with Honours (at Level 8 of the Australian Qualifications Framework) in the discipline of Information Technology, as defined by the School of IT.

(III) the maximum permissible reduction in the volume of learning is 24 credit points for a bachelor's degree with Honours (at Level 8 of the Australian Qualifications Framework) in the discipline of Engineering, as defined by the School of IT, with a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering.

(IV) the maximum permissible reduction in the volume of learning is 12 credit points for a Graduate Diploma (at Level 8 of the Australian Qualifications Framework) in the discipline of Information Technology, as defined by the School of IT.

(V) the maximum permissible reduction in the volume of learning is 12 credit points for a four-year Bachelor of Information Technology (pass) (Course Code: BPINFTEC2000) only at the University of Sydney (at Level 7 of the Australian Qualifications Framework).

13 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.

14 Satisfactory progress

Progression is subject to the Coursework Rule. A candidate who has failed to meet these progression rules for the Master of Information Technology Managment will be transferred to either the Graduate Diploma or the Graduate Certificate in Information Technology Management, depending on the credit points successfully completed.

15 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 eight ~~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 twelve semesters.

16 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January 2015 and students who commenced their candidature prior to 1 January, 2015 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January 2015 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Unit of study table

Unit of study	*Credit points*	*A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition*	*Session*
Master of Information Technology Management			
Core, Specialist, Elective, Foundation, Professional Pathway Project and Research Pathway Research units of study for the Master of Information Technology Management, Graduate Diploma in Information Technology Management and the Graduate Certificate in Information Technology Management are shown in the following table.			
Candidates for the degree of Master of Information Technology Management are required to complete 72 credit points from the units of study as outlined below.			
Candidates commence their enrolment in the Professional pathway. After completing 24 credit points of coursework, candidates may enrol in 12 credit points of Professional Pathway Project units.			
For the Professional Pathway, the following units must be completed:			
1. a minimum of 18 credit points of Core units of study			
2. a minimum of 18 credit points of Specialist units of study			
3. a maximum of 12 credit points of Foundation units of study			
4. a minimum of 12 credit points of Professional Pathway Project units of study			
5. no credit points of Research Pathway units of study.			
After completing 24 credit points, candidates 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.			
For the Research Pathway, the following units must be completed:			
1. a minimum of 18 credit points of Core units of study.			
2. a minimum of 12 credit points of Specialist units of study			
3. a maximum of 12 credit points of Foundation units of study			
4. a minimum of 24 credit points of Research Pathway units of study			
5. no Professional Pathway Project units of study.			
Candidates for the Graduate Diploma in Information Technology Management are required to complete 48 credit points from the units of study as follows:			
1. a minimum of 6 credit points of Core units of study, including INFO5990; and			
2. a minimum of 12 credit points of Specialist units of study, excluding Project units; and			
3. a maximum of 12 credit points of Foundation units of study.			
Candidates for the Graduate Certificate in Information Technology Management are required to complete 24 credit points from the units of study as follows:			
1. a minimum of 6 credit points of the Core units listed including INFO5990;			
2. a minimum of 6 credit points of Specialist units of study excluding Project units; and			
3. a maximum of 12 credit points of Foundation units of study.			
Core units			
Candidates for the Master of Information Technology Management must complete all three Core units.			
INFO5990 **Professional Practice in IT**	6	**A** Students enrolled in INFO5990 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have many years experience as a practising IT professional. *The main focus of the subject is to provide students with the necessary tools, basic skills, experience and adequate knowledge so they develop an awareness and an understanding of the responsibilities and issues associated with professional conduct and practice in the information technology sector.*	Semester 1 Semester 2
INFO5992 **Understanding IT Innovations**	6	**A** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **N** PMGT5875 *A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.*	Semester 1 Semester 2
INFO6007 **Project Management in IT**	6	**A** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **N** PMGT5871	Semester 1 Semester 2
Specialist units			
Candidates for the Master of Information Technology Management must take a minimum of 18 credit points of Specialist units.			
COMP5206 **Information Technologies and Systems**	6		Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
INFO5060 **Data Analytics and Business Intelligence**	6	**A** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems	Summer Early
INFO5301 **Information Security Management**	6	**A** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable.	Semester 1
INFO5991 **Services Science Management and Eng**	6	**A** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business. *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO6010 **Advanced Topics in IT Project Management**	6	**A** Students are assumed to understand the role of IT projects. **P** INFO6007, OR 3-5 years working experience in IT Project Management	Semester 2
INFO6012 **Information Technology Strategy & Value**	6	**A** COMP5206. Introduction to Information Systems	Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.	Semester 1
ISYS5070 **Change Management in IT**	6	**A** The unit is expected to be taken after the following related units INFO6007 Project Managemnet in IT and COMP5206 Introduction to Information Systems.	Winter Main
Elective units			
CISS6022 **Cybersecurity**	6		Semester 1
COMP5045 **Computational Geometry**	6	**A** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees.	Semester 1
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5048 **Visual Analytics**	6	**A** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills.	Semester 2
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5313 **Large Scale Networks**	6	**A** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. *Note: Department permission required for enrolment*	Semester 1
COMP5318 **Knowledge Discovery and Data Mining**	6	**A** INFO9120 OR COMP5138	Semester 1
COMP5338 **Advanced Data Models**	6	**A** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1).	Semester 2
COMP5347 **Web Application Development**	6	**A** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams.	Semester 1
COMP5348 **Enterprise Scale Software Architecture**	6	**A** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.	Semester 1
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1
COMP5415 **Multimedia Design and Authoring**	6	**A** COMP5114 or COMP9419.	Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
COMP5424 **Information Technology in Biomedicine**	6		Semester 1
COMP5425 **Multimedia Retrieval**	6	**A** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge.	Semester 1
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	Semester 1
COMP5427 **Usability Engineering**	6		Semester 2
COMP5456 **Introduction to Bioinformatics** *This unit of study is not available in 2015*	6	**A** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **N** COMP3456	Summer Main
COMP5705 **Information Technology Short Project**	6	**N** COMP5704, COMP5703, COMP5702 *Specialist/Elective/Project*	Semester 1 Semester 2 Summer Late Winter Main
COMP5706 **IT Industry Placement Project**	6	**N** COMP5702, COMP5703, COMP5704	Semester 1 Semester 2
ELEC5507 **Error Control Coding**	6	**A** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired.	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.	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.	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.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	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) **N** MECH5701	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2
IDEA9106 **Design Thinking**	6		Semester 1 Semester 2
INFO5306 **Enterprise Healthcare Info Systems**	6	**A** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS).	Semester 2
INFS6012 **Enterprise Systems Management**	6	*This is a defined elective unit of study in both the Master of Professional Accounting and the Master of Commerce programs.*	Semester 1
INFS6015 **Business Process Management**	6		Semester 2
INFS6016 **Technology Enabled Business Innovation**	6	**A** Understanding the major functions of a business and how those business functions interact internally and externally so the company can be competitive in the market is essential in order to critically analyse how and where a business can be innovative. Some knowledge of how technology can be applied in a business is also essential. Experience as a member of a project team is desirable.	Semester 2
INFS6018 **Managing Business Intelligence**	6		Semester 1
PUBH5010 **Epidemiology Methods and Uses**	6	**N** BSTA5011	Semester 1
STAT5003 **Computational Statistical Methods**	6	**P** STAT5002 *Note: Department permission required for enrolment*	Semester 2
Foundation Units			
COMP5116 **Design of Networks & Distributed Systems**	6		Semester 2
COMP5213 **Computer and Network Organisation**	6		Semester 1
COMP9007 **Algorithms**	6	**A** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **N** COMP5211	Semester 2
COMP9103 **Software Development in Java**	6	**N** COMP5214	Semester 1 Semester 2
COMP9110 **System Analysis and Modelling**	6	**A** Experience with a data model as in COMP9129 or COMP9103 or INFO9220 or INFO9120 or COMP5212 or COMP5214 or COMP5028 or COMP5138 **N** : ELEC3610 OR ELEC5743 OR INFO2110 OR INFO5001	Semester 2
COMP9120 **Database Management Systems**	6	**A** Some exposure to programming and some familiarity with data model concepts **N** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content.	Semester 1 Semester 2
COMP9220 **Object-Oriented Design**	6	**A** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **N** : COMP5028 OR INFO3220	Semester 1
INFO9117 **Intro to Software Engineering Practice**	6	**A** Skill as an individual programmer (as expected from any IT graduate, who could be admitted to GCertIT, GDipIT or MIT degree)	Semester 1 Semester 2
Only one of the two units COMP9220 Object-Oriented Design or INFO9110 Systems Analysis & Modelling can be taken.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Professional Pathway Project Units			
The minimum requirement for the Professional Pathway is 12 credit points of Information Technology Capstone project units. These can be completed either as the two 6 credit point units, COMP5707 and COMP5708, over two semesters, or as the 12 credit point unit, COMP5703, in one semester.			
COMP5703 **Information Technology Project**	12	**P** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. **N** : COMP5702 OR COMP5704 OR COMP5707 OR COMP5708	Semester 1 Semester 2
COMP5707 **Information Technology Capstone A**	6	**N** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2
COMP5708 **Information Technology Capstone B**	6	**C** Corequisite: COMP5707 **N** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2
Research Pathway units			
The Research Pathway is available to candidates who achieve Distinction (75%) average results or above in their first 24 credit points of enrolment, subject to the approval of the Program Director.			
COMP5702 **IT Research Project A**	12	**A** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **N** : COMP5707 OR COMP5708 OR COMP5703. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2
COMP5704 **IT Research Project B**	6	**A** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **P** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take this unit. **N** : COMP5707 OR COMP5708 OR COMP5703. Students enrolling (and eligible) for the IT Research Project are not eligible to enrol in the IT Capstone Project Units. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2
INFO5993 **IT Research Methods**	6		Semester 1 Semester 2

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Information Technology Management

Core, Specialist, Elective, Foundation, Professional Pathway Project and Research Pathway Research units of study for the Master of Information Technology Management, Graduate Diploma in Information Technology Management and the Graduate Certificate in Information Technology Management are shown in the following table.Candidates for the degree of Master of Information Technology Management are required to complete 72 credit points from the units of study as outlined below.Candidates commence their enrolment in the Professional pathway. After completing 24 credit points of coursework, candidates may enrol in 12 credit points of Professional Pathway Project units. For the Professional Pathway, the following units must be completed:1. a minimum of 18 credit points of Core units of study2. a minimum of 18 credit points of Specialist units of study3. a maximum of 12 credit points of Foundation units of study4. a minimum of 12 credit points of Professional Pathway Project units of study5. no credit points of Research Pathway units of study.After completing 24 credit points, candidates 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.For the Research Pathway, the following units must be completed:1. a minimum of 18 credit points of Core units of study.2. a minimum of 12 credit points of Specialist units of study3. a maximum of 12 credit points of Foundation units of study4. a minimum of 24 credit points of Research Pathway units of study5. no Professional Pathway Project units of study.Candidates for the Graduate Diploma in Information Technology Management are required to complete 48 credit points from the units of study as follows:1. a minimum of 6 credit points of Core units of study, including INFO5990; and2. a minimum of 12 credit points of Specialist units of study, excluding Project units; and3. a maximum of 12 credit points of Foundation units of study.Candidates for the Graduate Certificate in Information Technology Management are required to complete 24 credit points from the units of study as follows:1. a minimum of 6 credit points of the Core units listed including INFO5990;2. a minimum of 6 credit points of Specialist units of study excluding Project units; and 3. a maximum of 12 credit points of Foundation units of study.

Core units

Candidates for the Master of Information Technology Management must complete all three Core units.

INFO5990
Professional Practice in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students enrolled in INFO5990 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have many years experience as a practising IT professional. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: The main focus of the subject is to provide students with the necessary tools, basic skills, experience and adequate knowledge so they develop an awareness and an understanding of the responsibilities and issues associated with professional conduct and practice in the information technology sector.

This Unit of Study introduces the students to some of the concepts, standards and techniques associated with the current professional practice in information technology in the business environment.

Students will encounter a range of concepts, techniques and professional issues including interpersonal and organisational communication, human resources and conflict resolution, globalisation, professional ethics, social impacts of IT, data security, data quality assurance, system audit, investigative research and project management practice. Practical and real world case studies will be used as part of the learning to enhance the in-class teachings to the needs of industry.

INFO5992
Understanding IT Innovations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prohibitions:** PMGT5875 **Assumed knowledge:** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.

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.

INFO6007
Project Management in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture Workshop 3 hrs/week; WeeklyAssignments 5 hrs; Exam Preparation 16 hrs. **Prohibitions:** PMGT5871 **Assumed knowledge:** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers the factors necessary for successful management of a wide variety of Information Technology projects. The course covers both quantitative and qualitative aspects of project management. Topics include the management of time, scope, budget, risk, quality, and resources through each of the phases of a project.

Specialist units

Candidates for the Master of Information Technology Management must take a minimum of 18 credit points of Specialist units.

COMP5206
Information Technologies and Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive introduction to the field of information systems from organisational and managerial perspectives. The emergence of the digital firm and its implications will be studied. The critical role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Key topics covered will include:

*Basic Information Systems Concepts

*Systems Approach and Systems Thinking

*E-Business and E-Commerce

*IT Strategy and Competitive Advantage

*Data and Knowledge Management

*Information Systems Development and IS Management

*Decision support systems, business intelligence and online analytical processing systems (OLAP)

*Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems, Enterprise Content Management and Supply Chain Management (SCM) systems

*Ethical, Legal and Social Aspects of Information technologis.

INFO5060
Data Analytics and Business Intelligence

Credit points: 6 **Session:** Summer Early **Classes:** Lecture 4 hrs; Tutorial 2 hrs; Laboratory 6 hrs; Presentation 3 hrs; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Block mode

The frontier for using data to make decisions has shifted dramatically. High performing enterprises are now building their competitive strategies around data-driven insights that in turn generate impressive business results. This course provides an overview of Business Intelligence (BI) concepts, technologies and practices, and then focuses on the application of BI through a team based project simulation that will allow students to have practical experience in building a BI solution based on a real world case study.

INFO5301
Information Security Management

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study gives a broad view of the management aspects of information security. We emphasise corporate governance for information security, organisational structures within which information security is managed, risk assessment, and control structures. Planning for security, and regulatory issues, are also addressed.

INFO5991
Services Science Management and Eng

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Seminar 2 hrs/week. **Assumed knowledge:** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The service economy plays a dominant and growing role in growth and employment in most parts of the world. Increasingly, the improved productivity and competitive performance of firms and nations in the services arena relies on innovative and effective design, engineering and management of IT-centric services. In response to industry needs, this unit offers IT professionals a social, economic and technical perspective of service-oriented IT.

INFO6010
Advanced Topics in IT Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial (applied workshop) 1 hr/week; E-Learning 1 hr/week. **Prerequisites:** INFO6007, OR 3-5 years working experience in IT Project Management **Assumed knowledge:** Students are assumed to understand the role of IT projects. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the limitations of IT project management and the most promising techniques to overcome project failure. It will start by reviewing case study research showing we have reached the limits of traditional IT project management practice. The theoretical base will be completed by exploring the finding that senior management have more impact on success than traditional approaches.

Participants will be introduced to and learn to apply the most promising tools and techniques needed to govern IT projects. The topics reviewed will include:

1)strategy,

2)organisational change,

3)project sponsorship,

4)programme management,

5)performance measurement,

6)culture

7)portfolio management.

8)Relevant Australian and International Standards on IT/Project Governance and new industry methodologies around portfolio, programme and change management will be reviewed.

INFO6012
Information Technology Strategy & Value

Credit points: 6 **Session:** Semester 2 **Classes:** Flexible Session 3 hrs/week. **Assumed knowledge:** COMP5206. Introduction to Information Systems **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The increasingly strategic role of IT in organisations is widely recognised. This unit of study is designed to provide a comprehensive introduction to strategic aspects of IT as they impact on business value. Such a perspective is critical for IT professionals in both IT producer and user organisations from the level of Chief Information Officer to managers as well as technical specialists. Deep understanding of IT strategy formulation and implementation and ensuring its alignment with the organisation's strategic directions is important for successfully managing the major changes that the IT function has undergone in recent years.

Topics covered will include technology forecasting and assessment of IT impacts, achieving sustainable competitive through IT, relationship between IT strategy and value, IT strategy formulation and implementation, evaluation of strategic investments in IT, IT portfolio management, IT souring and open innovation, and dynamics of IT strategy and game theory. It will explore IT-related strategic decision making at the different organisational levels and the concept of strategic congruence. This unit will provide students with models, tools, and techniques to evaluate an organisation's IT strategic position, and hence to help make appropriate strategic choices.

ISYS5050
Knowledge Management Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The need to track and facilitate the sharing of the core knowledge resources in contemporary organisations is widely recognised. This course will provide a comprehensive introduction to the emerging area of Knowledge Management (KM) from both technological and organisational perspectives. We will review and discuss a range of published papers, case studies, and other publications that deal with a range of important KM-related topics. One of the key knowledge management technologies, Business Intelligence Systems, will be covered in detail. It will also include hands-on work using the BI (Online Analytical Processing - OLAP) tool, COGNOS.

Some of the main themes to be covered will include:

oKM: Conceptual Foundations

oTaxonomies of organizational knowledge and KM mechanisms

oCase/Field Studies of KM Initiatives

o Data Warehousing and OLAP/Business Analytics

oData, text, and web mining.

oSocial media,crowdsourcing, an KM

ISYS5070
Change Management in IT

Credit points: 6 **Session:** Winter Main **Classes:** Lecture 6 hrs/week; Tutorial 6 hrs/week; Presentation 3 hrs/week; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after the following related units INFO6007 Project Managemnet in IT and COMP5206 Introduction to Information Systems. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Block mode

This unit of study presents the leading edge of research and practice in change management and focuses on theories, frameworks and perspectives that can guide your work as a change agent in the IT industries. The unit will cover a range of approaches, methods, interventions and tools that can be used to successfully manage change projects that relate to the implementation of new technologies.

The globalisation of markets and industries, accelerating technological innovations and the need of companies to remain at the forefront of technological developments in an increasingly competitive, globalised industry have resulted in a significant increase in the speed, magnitude, and unpredictability of technological and organisational change over the last decades. Companies who have the competencies required to navigate change and overcome the inevitable obstacles to success gain a much-needed competitive edge in the marketplace. Increased globalization, economic rationalism, environmental dynamics and technological changes mean that companies, more than ever before, need to be highly flexible and adaptable to survive and thrive. Yet, a large percentage of IT projects fail to achieve the intended objectives, go over time or over budget. The capability to successfully manage organisational and technological change has become a core competency for IT professionals, business leaders and project managers.

This unit has been specifically developed for IT professionals, project managers, and senior managers to equip them with the knowledge and tools needed to ensure that IT projects remain on track to achieving the intended objectives on time and on budget. The course presents the key theories, concepts and findings in the context of academic research and change management practice. The objective is to allow participants to critically assess academic theories and methodological practice and devise interventions and actions that allow the successful management of IT initiatives.

Elective units

CISS6022
Cybersecurity

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week **Assessment:** 1x2hr exam (40%), 1x3000wd analytical Essay (40%), 1x1000wd equivalent lab exercise (10%), 1xSeminar participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The digital revolution has created new frontiers of information that influence almost every aspect of our lives. But does cyberspace also threaten our security? What are the methods and motives for attack? And how can state and non-state actors respond? Drawing on a unique combination of expertise from the Centre for International Security Studies and the School of Information Technologies, this unit introduces students to the technical and political concepts that are necessary to answer these important questions.

COMP5045
Computational Geometry

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - in class 12 hrs/week. **Assumed knowledge:** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees. **Assessment:** Through semester assessment (80%) Final Exam (20%) **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 geometric 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.

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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
Visual Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Visual Analytics aims to facilitate the data analytics process through Information Visualisation. Information Visualisation aims 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 challenge for Visual Analytics is to design and implement "effective Visualisation methods that produce pictorial representation of complex data so that data analysts from various fields (bioinformatics, social network, software visualisation and network) can visually inspect complex data and carry out critical decision making.

This unit will provide basic HCI concepts, Visualisaiton 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 Visual Analytic methods.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5313
Large Scale Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The growing connectedness of modern society translates into simplifying global communication and accelerating spread of news, information and epidemics. The focus of this unit is on the key concepts to address the challenges induced by the recent scale shift of complex networks. In particular, the course will present how scalable solutions exploiting graph theory, sociology, game theory and probability tackle the problems of communicating (routing, diffusing, aggregating) in dynamic and social networks.

COMP5318
Knowledge Discovery and Data Mining

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** INFO9120 OR COMP5138 **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 for data, by automatic and 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

COMP5338
Advanced Data Models

Credit points: 6 **Session:** Semester 2 **Classes:** Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1). **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 data storage technology. Particular emphasis is put on spatial, temporal, and NoSQL data storage. This unit extensively covers the advanced features of SQL:2003, as well as a few dominant NoSQL storage technologies. Besides in lectures, the advanced topics will be also studied with prescribed readings of database research publications.

COMP5347
Web Application Development

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week; Project Work - own time 3 hrs/week; Independent Study, **Assumed knowledge:** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5415
Multimedia Design and Authoring

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5114 or COMP9419. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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, communication and security. Specialist areas such as Picture Archiving and Communication Systems (PACS), computer-aided diagnosis (CAD), 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 Retrieval

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 retrieval techniques demanded by users to meet their information needs. This unit provides students with the most updated knowledge in order to address this issue in the context of big data, from the basics of textual information retrieval, to many advanced techniques in the field, such as large scale retrieval and social media.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

COMP5456
Introduction to Bioinformatics

This unit of study is not available in 2015

Credit points: 6 **Session:** Summer Main **Classes:** Laboratory 2 hrs/week; Lecture 2 hrs/week. **Prohibitions:** COMP3456 **Assumed knowledge:** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit brings together a wide range of skills 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. The unit covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research. It further 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.

COMP5705
Information Technology Short Project

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Late, Winter Main **Classes:** Meeting 1 hr/week; Project Work - own time, **Prohibitions:** COMP5704, COMP5703, COMP5702 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Specialist/Elective/Project

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's 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 **Prohibitions:** COMP5702, COMP5703, COMP5704 **Mode of delivery:** Supervision

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 gets split over both semester 1 and semester 2.

ELEC5507
Error Control Coding

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

IDEA9106
Design Thinking

Credit points: 6 **Teacher/Coordinator:** Dr Lian Loke **Session:** Semester 1, Semester 2 **Classes:** Lecture 1hr/wk, Tutorial 2hrs/wk **Assessment:** Design assignments (90%), Participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an overview of a human (or user) centred approach to the design of interactive technologies. It introduces students to design thinking and how it can be productively applied to different design situations. The theoretical concepts, methods and tools for the key stages of interaction design are covered including user research, ideation, prototyping and user evaluation. The cognitive processes of individual designers are also explored. Students learn to persuasively communicate and pitch design concepts with an emphasis on the user experience through visual storytelling and the use of video. It provides students with the principles, processes and tools for working on user-centred design in studio projects. Students will acquire the following learning outcomes:

1. An appreciation of the role of design thinking in traditional and cross-disciplinary contexts

2. Theoretical and practical understanding and application of human-centred methodologies, methods and tools

3. Demonstration of ideation and concept development, informed by user and background research, to innovate interactive technology solutions to complex problems

4. Awareness of design processes and cognition in collaborative, inter-disciplinary teams

5. Demonstration of persuasive oral/visual communication techniques

INFO5306
Enterprise Healthcare Info Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS). **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Healthcare systems intimately coupled to ICT have been at the forefront of many of the medical advances in modern society in the past decade. As is already the case in many other service-driven sectors, it is widely recognised that a key approach to solve some of the healthcare challenges is to harness and further ICT innovations. This unit is designed to help fill a massive technology talent gap where one of the biggest IT challenges in history is in the technology transformation of healthcare.

The unit will consist of weekly lectures, a set of group discussions (tutorials) and practical lab sessions. The contents will offer students the opportunity to develop IT knowledge and skills related to all aspects of Enterprise Healthcare Information Systems. Key Topics covered include:

* Health Information System e.g., Picture Archiving and Communication Systems (PACS) and Radiology IS
* Electronic Health Records / Personal Health Records
* Health data management
* Healthcare Transactions
* Health Statistics and Research
* Decision Support Systems including Image-based systems
* Cost Assessments and Ethics / Privacy
* TeleHealth / eHealth
* Cases studies with Australian Hospitals

Guest lecturers from the healthcare industry will be invited. The core of student's assessments will be based on individual research reports (topics related to the current industry IT needs), software / practical assignment and quizzes.

INFS6012
Enterprise Systems Management

Credit points: 6 **Teacher/Coordinator:** Jenny Leonard **Session:** Semester 1 **Classes:** 1x 3hr seminar per week **Assessment:** mid-semester test (35%), individual enterprise system portfolio (35%), and group report (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a defined elective unit of study in both the Master of Professional Accounting and the Master of Commerce programs.

This unit explores the strategic managerial issues that arise from the implementation and use of Enterprise Systems as a means of integrating data and standardising processes. The unit utilises a combination of practical sessions with an Enterprise System, such as SAP, and analyses based on readings of case studies to explore the long-term effects of strategic implementation decisions, and issues with regard to Enterprise System implementation projects. The unit explores the emergence and implications of cloud-based Enterprise Systems, and the part that Enterprise Systems play in an organisation's broader information infrastructure.

INFS6015
Business Process Management

Credit points: 6 **Teacher/Coordinator:** Olivera Marjanovic **Session:** Semester 2 **Classes:** 1x 3hr seminar per week **Assessment:** individual assignment (35%), group assignment (25%), and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an overview of the business process architecture and life cycle from a management perspective. It provides a detailed understanding of the concepts, strategies, tools and technologies required for modelling, analysis, design, improvement, integration, performance measurement and governance of business processes (both intra- and inter-enterprise) in any organisational and/or value chain context and relevant industry standards. The unit also develops practical skills in modelling, redesigning and improving business processes using various business process management software tools/suites.

INFS6016
Technology Enabled Business Innovation

Credit points: 6 **Teacher/Coordinator:** TBA **Session:** Semester 2 **Classes:** 1 x 3hr seminar per week **Assumed knowledge:** Understanding the major functions of a business and how those business functions interact internally and externally so the company can be competitive in the market is essential in order to critically analyse how and where a business can be innovative. Some knowledge of how technology can be applied in a business is also essential. Experience as a member of a project team is desirable. **Assessment:** individual research assignment (15%), individual problem-based assignment (35%), and group problem-based assignment (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit develops knowledge and skills in innovative, technology-enabled business models and strategies from a management perspective. The unit facilitates a better understanding and application of the concepts, strategies, tools and technologies necessary for undertaking business innovation. From basic knowledge of business models and essential business processes, this unit increases awareness and understanding of stakeholders, their capabilities and their limitations in the strategic convergence of technology and business. It provides insights into the technology and infrastructure required to support commerce in the 21st Century and supports development of student capabilities to analyse, develop and evaluate innovative technology-enabled business strategies and models.

INFS6018
Managing Business Intelligence

Credit points: 6 **Teacher/Coordinator:** Olivera Marjanovic **Session:** Semester 1 **Classes:** 1 x 3hr seminar per week **Assessment:** tutorial work (10%), mid-session exam (30%), practical assignment (20%), and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Business Intelligence (BI), increasingly known as Business Analytics, is a major source of competitive advantage in the Information Age and is therefore a leading business priority globally. In recent times, this field has evolved from a technology topic to a management priority, creating an unprecedented demand for new management skills. Taking a business rather than technology perspective, this unit covers all aspects of the enterprise BI ecosystem in the context of strategic and operational BI, including all five stages of BI evolution. Topics include assessment and management of organisational data quality, multidimensional data modelling and integration, management of structured and unstructured data (including those created by social media), business aspects of data warehousing, innovation through advanced analytics, BI driven performance management, business process intelligence, active enterprise intelligence, and management of complex BI projects. Access is provided to the largest world-wide community of BI academics and industry practitioners called TUN (www.TeradataUniversityNetwork.com). The hands-on experience in using a commercial BI platform, combined with in-depth analytical skills, will enable students completing the unit to help any organization (regardless of its size and industry domain) to derive more intelligence from its data and compete on analytics. This unit does not require programming experience; it is suitable for both current and aspiring BI practitioners as well as general business practitioners from any functional area interested to learn how to start and lead BI-related initiatives.

PUBH5010
Epidemiology Methods and Uses

Credit points: 6 **Teacher/Coordinator:** Professor Tim Driscoll **Session:** Semester 1 **Classes:** 1x 1hr lecture and 1x 2hr tutorial per week for 13 weeks - lectures and tutorials may be completed online **Prohibitions:** BSTA5011 **Assessment:** 1x 4page assignment (30%) and 1x 2.5hr supervised open-book exam (70%). For distance students, it may be possible to complete the exam externally with the approval of the course coordinator. **Mode of delivery:** Online

This unit provides students with core skills in epidemiology, particularly the ability to critically appraise public health and clinical epidemiological research literature. This unit covers: study types; measures of frequency and association; measurement bias; confounding/effect modification; randomized trials; systematic reviews; screening and test evaluation; infectious disease outbreaks; measuring public health impact and use and interpretation of population health data. It is expected that students spend an additional 2-3 hours at least preparing for their tutorials.

Textbooks

Webb, PW. Bain, CJ. and Pirozzo, SL. Essential Epidemiology: An Introduction for Students and Health Professionals Second Edition: Cambridge University Press 2011.

STAT5003
Computational Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Shelton Peiris **Session:** Semester 2 **Classes:** Two lectures and one tutorial per week. **Prerequisites:** STAT5002 **Assessment:** 2 hour examination (60%), assignments (20%), quizzes (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: Department permission required for enrolment.

The objectives of this unit of study are to develop an understanding of modern computationally intensive methods for statistical inference, exploratory data analysis and data mining. Advanced computational methods for statistics will be introduced, including univariate, multivariate and combinatorial optimisation methods and simulation methods, such as Gibbs sampling, the Bootstrap, Monte Carlo and the Jackknife approach. In addition, the unit will demonstrate how to apply the above techniques effectively for use on large data sets in practice. Finally, this unit will show how to make inferences about populations of interest in data mining problems.

Textbooks

Computational Statistics, Geof H. Givens, Jennifer A. Hoeting, Wiley (2005)

Foundation Units

COMP5116
Design of Networks & Distributed Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit covers general foundations of communication systems and a detailed walk through of the implementation of the TCP/IP protocol stack, which forms the basis of the Internet. The unit also covers the basic knowledge of how to analyse, design and implement simple communication protocols.

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 and design.

COMP5213
Computer and Network Organisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to computer organisation and network protocols. It covers a broad range of topics including computer hardware, software architecture (operating systems, compilers, etc), and principles of communication network protocols. It is designed to give students an understanding of how software programs operate and run inside the computer hardware, and therefore the knowledge how to use computers most effectively.

COMP9007
Algorithms

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour lectures and one 1 hour tutorial per week. **Prohibitions:** COMP5211 **Assumed knowledge:** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 computational thinking from simple list manipulation and data format conversion, up to shortest paths and cycle detection in graphs. Students will gain essential knowledge in computer science, including basic concepts in data structures, algorithms, and intractability, using paradigms such as dynamic programming, divide and conquer, greed, local search, and randomisation, as well NP-hardness.

COMP9103
Software Development in Java

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 1 hours per week **Prohibitions:** COMP5214 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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. Students will be progressively guided in 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.

COMP9110
System Analysis and Modelling

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Tutorial: 1 hours per week **Prohibitions:** : ELEC3610 OR ELEC5743 OR INFO2110 OR INFO5001 **Assumed knowledge:** Experience with a data model as in COMP9129 or COMP9103 or INFO9220 or INFO9120 or COMP5212 or COMP5214 or COMP5028 or COMP5138 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 on-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. Note: The lectures of this unit are co-taught with INFO2110.

COMP9120
Database Management Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 2 hour tutorial per week. **Prohibitions:** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content. **Assumed knowledge:** Some exposure to programming and some familiarity with data model concepts **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

Note that the first two thirds of the lectures of this foundational unit will be co-taught with the corresponding undergraduate class in semester 1 (INFO2120); tutorials and assignments will be organised separately.

COMP9220
Object-Oriented Design

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** : COMP5028 OR INFO3220 **Assumed knowledge:** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces essential object-oriented design methods and language mechanisms, especially the principles of modelling through Rational Unified Process and agile processes using Unified Modeling Language (UML) and Java or C++, both of which are industry standard. Students work in small groups to experience the process of object-oriented analysis, object-oriented design, implementation and testing by building a real-world application. Java or C++ is used as the implementation language and a special emphasis is placed on those features of Java or C++ that are important for solving real-world problems. Advanced software engineering features, including exceptions and name spaces are thoroughly covered.

INFO9117
Intro to Software Engineering Practice

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hour per week; Tutorial 2 hours per week. **Assumed knowledge:** Skill as an individual programmer (as expected from any IT graduate, who could be admitted to GCertIT, GDipIT or MIT degree) **Assessment:** Through semester assessment (50%), Final Exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is an elective for students in the postgraduate IT degrees. It is expected to be taken early in the degree if (and only if) their undergraduate education and subsequent experience have not covered this vital aspect, namely working in groups under a defined process to deliver a software development project. Remark: the USyd undergraduate degrees in IT and in SE all cover this material, especially through the unit COMP3615 or INFO3600 and INFO3402; however, not all institutions guarantee this sort of experience for IT graduates. This unit will scaffold such students to do well in future group development projects, in their coursework or in industry, by providing fundamental knowledge of Software Engineering processes and practices. Much of the student's effort will be directed towards a carefully managed small-group project to deliver a software system to meet a client's needs; they will be working with a client who may be external, or who may be a member of the teaching staff role-playing as an external client. A member of the teaching staff (separate from anyone who is acting as client) will take the role of manager for the group, checking progress and providing feedback frequently. By the end of the unit, the students will understand the processes and practices used in group projects that develop software, and they will be able to follow these processes and practices, so that they can contribute effectively in a small group that is developing software to meet clients needs.

Only one of the two units COMP9220 Object-Oriented Design or INFO9110 Systems Analysis & Modelling can be taken.

Professional Pathway Project Units

The minimum requirement for the Professional Pathway is 12 credit points of Information Technology Capstone project units. These can be completed either as the two 6 credit point units, COMP5707 and COMP5708, over two semesters, or as the 12 credit point unit, COMP5703, in one semester.

COMP5703
Information Technology Project

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 18 hours; Meeting 1 hour. **Prerequisites:** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. **Prohibitions:** : COMP5702 OR COMP5704 OR COMP5707 OR COMP5708 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

COMP5707
Information Technology Capstone A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research/Project Work 9 hrs per week; Meeting 1 hr per week. **Prohibitions:** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report. It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

COMP5708
Information Technology Capstone B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research/Project Work 9 hours per week; Meeting 1 hour per week. **Corequisites:** Corequisite: COMP5707 **Prohibitions:** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report. It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

Research Pathway units

The Research Pathway is available to candidates who achieve Distinction (75%) average results or above in their first 24 credit points of enrolment, subject to the approval of the Program Director.

COMP5702
IT Research Project A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 22 hrs/week; Meeting 2 hrs/week. **Prohibitions:** : COMP5707 OR COMP5708 OR COMP5703. **Assumed knowledge:** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Research Project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to define an original research project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent research work in a setting and manner that fosters the development of IT skills in research.

COMP5704
IT Research Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 22 hours; Meeting 2 h ours. **Prerequisites:** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take this unit. **Prohibitions:** : COMP5707 OR COMP5708 OR COMP5703. Students enrolling (and eligible) for the IT Research Project are not eligible to enrol in the IT Capstone Project Units. **Assumed knowledge:** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Research Project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to define an original research project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent research work in a setting and manner that fosters the development of IT skills in research.

INFO5993
IT Research Methods

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

For more information on units of study visit CUSP.

Unit of study descriptions

Master of Information Technology Management

Core, Specialist, Elective, Foundation, Professional Pathway Project and Research Pathway Research units of study for the Master of Information Technology Management, Graduate Diploma in Information Technology Management and the Graduate Certificate in Information Technology Management are shown in the following table.Candidates for the degree of Master of Information Technology Management are required to complete 72 credit points from the units of study as outlined below.Candidates commence their enrolment in the Professional pathway. After completing 24 credit points of coursework, candidates may enrol in 12 credit points of Professional Pathway Project units. For the Professional Pathway, the following units must be completed:1. a minimum of 18 credit points of Core units of study2. a minimum of 18 credit points of Specialist units of study3. a maximum of 12 credit points of Foundation units of study4. a minimum of 12 credit points of Professional Pathway Project units of study5. no credit points of Research Pathway units of study.After completing 24 credit points, candidates 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.For the Research Pathway, the following units must be completed:1. a minimum of 18 credit points of Core units of study.2. a minimum of 12 credit points of Specialist units of study3. a maximum of 12 credit points of Foundation units of study4. a minimum of 24 credit points of Research Pathway units of study5. no Professional Pathway Project units of study.Candidates for the Graduate Diploma in Information Technology Management are required to complete 48 credit points from the units of study as follows:1. a minimum of 6 credit points of Core units of study, including INFO5990; and2. a minimum of 12 credit points of Specialist units of study, excluding Project units; and3. a maximum of 12 credit points of Foundation units of study.Candidates for the Graduate Certificate in Information Technology Management are required to complete 24 credit points from the units of study as follows:1. a minimum of 6 credit points of the Core units listed including INFO5990;2. a minimum of 6 credit points of Specialist units of study excluding Project units; and 3. a maximum of 12 credit points of Foundation units of study.

Core units

Candidates for the Master of Information Technology Management must complete all three Core units.

INFO5990
Professional Practice in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students enrolled in INFO5990 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have many years experience as a practising IT professional. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: The main focus of the subject is to provide students with the necessary tools, basic skills, experience and adequate knowledge so they develop an awareness and an understanding of the responsibilities and issues associated with professional conduct and practice in the information technology sector.

This Unit of Study introduces the students to some of the concepts, standards and techniques associated with the current professional practice in information technology in the business environment.

Students will encounter a range of concepts, techniques and professional issues including interpersonal and organisational communication, human resources and conflict resolution, globalisation, professional ethics, social impacts of IT, data security, data quality assurance, system audit, investigative research and project management practice. Practical and real world case studies will be used as part of the learning to enhance the in-class teachings to the needs of industry.

INFO5992
Understanding IT Innovations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prohibitions:** PMGT5875 **Assumed knowledge:** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.

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.

INFO6007
Project Management in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture Workshop 3 hrs/week; WeeklyAssignments 5 hrs; Exam Preparation 16 hrs. **Prohibitions:** PMGT5871 **Assumed knowledge:** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers the factors necessary for successful management of a wide variety of Information Technology projects. The course covers both quantitative and qualitative aspects of project management. Topics include the management of time, scope, budget, risk, quality, and resources through each of the phases of a project.

Specialist units

Candidates for the Master of Information Technology Management must take a minimum of 18 credit points of Specialist units.

COMP5206
Information Technologies and Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive introduction to the field of information systems from organisational and managerial perspectives. The emergence of the digital firm and its implications will be studied. The critical role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Key topics covered will include:

*Basic Information Systems Concepts

*Systems Approach and Systems Thinking

*E-Business and E-Commerce

*IT Strategy and Competitive Advantage

*Data and Knowledge Management

*Information Systems Development and IS Management

*Decision support systems, business intelligence and online analytical processing systems (OLAP)

*Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems, Enterprise Content Management and Supply Chain Management (SCM) systems

*Ethical, Legal and Social Aspects of Information technologis.

INFO5060
Data Analytics and Business Intelligence

Credit points: 6 **Session:** Summer Early **Classes:** Lecture 4 hrs; Tutorial 2 hrs; Laboratory 6 hrs; Presentation 3 hrs; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Block mode

The frontier for using data to make decisions has shifted dramatically. High performing enterprises are now building their competitive strategies around data-driven insights that in turn generate impressive business results. This course provides an overview of Business Intelligence (BI) concepts, technologies and practices, and then focuses on the application of BI through a team based project simulation that will allow students to have practical experience in building a BI solution based on a real world case study.

INFO5301
Information Security Management

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study gives a broad view of the management aspects of information security. We emphasise corporate governance for information security, organisational structures within which information security is managed, risk assessment, and control structures. Planning for security, and regulatory issues, are also addressed.

INFO5991
Services Science Management and Eng

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Seminar 2 hrs/week. **Assumed knowledge:** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The service economy plays a dominant and growing role in growth and employment in most parts of the world. Increasingly, the improved productivity and competitive performance of firms and nations in the services arena relies on innovative and effective design, engineering and management of IT-centric services. In response to industry needs, this unit offers IT professionals a social, economic and technical perspective of service-oriented IT.

INFO6010
Advanced Topics in IT Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial (applied workshop) 1 hr/week; E-Learning 1 hr/week. **Prerequisites:** INFO6007, OR 3-5 years working experience in IT Project Management **Assumed knowledge:** Students are assumed to understand the role of IT projects. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the limitations of IT project management and the most promising techniques to overcome project failure. It will start by reviewing case study research showing we have reached the limits of traditional IT project management practice. The theoretical base will be completed by exploring the finding that senior management have more impact on success than traditional approaches.

Participants will be introduced to and learn to apply the most promising tools and techniques needed to govern IT projects. The topics reviewed will include:

1)strategy,

2)organisational change,

3)project sponsorship,

4)programme management,

5)performance measurement,

6)culture

7)portfolio management.

8)Relevant Australian and International Standards on IT/Project Governance and new industry methodologies around portfolio, programme and change management will be reviewed.

INFO6012
Information Technology Strategy & Value

Credit points: 6 **Session:** Semester 2 **Classes:** Flexible Session 3 hrs/week. **Assumed knowledge:** COMP5206. Introduction to Information Systems **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The increasingly strategic role of IT in organisations is widely recognised. This unit of study is designed to provide a comprehensive introduction to strategic aspects of IT as they impact on business value. Such a perspective is critical for IT professionals in both IT producer and user organisations from the level of Chief Information Officer to managers as well as technical specialists. Deep understanding of IT strategy formulation and implementation and ensuring its alignment with the organisation's strategic directions is important for successfully managing the major changes that the IT function has undergone in recent years.

Topics covered will include technology forecasting and assessment of IT impacts, achieving sustainable competitive through IT, relationship between IT strategy and value, IT strategy formulation and implementation, evaluation of strategic investments in IT, IT portfolio management, IT souring and open innovation, and dynamics of IT strategy and game theory. It will explore IT-related strategic decision making at the different organisational levels and the concept of strategic congruence. This unit will provide students with models, tools, and techniques to evaluate an organisation's IT strategic position, and hence to help make appropriate strategic choices.

ISYS5050
Knowledge Management Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The need to track and facilitate the sharing of the core knowledge resources in contemporary organisations is widely recognised. This course will provide a comprehensive introduction to the emerging area of Knowledge Management (KM) from both technological and organisational perspectives. We will review and discuss a range of published papers, case studies, and other publications that deal with a range of important KM-related topics. One of the key knowledge management technologies, Business Intelligence Systems, will be covered in detail. It will also include hands-on work using the BI (Online Analytical Processing - OLAP) tool, COGNOS.

Some of the main themes to be covered will include:

oKM: Conceptual Foundations

oTaxonomies of organizational knowledge and KM mechanisms

oCase/Field Studies of KM Initiatives

o Data Warehousing and OLAP/Business Analytics

oData, text, and web mining.

oSocial media,crowdsourcing, an KM

ISYS5070
Change Management in IT

Credit points: 6 **Session:** Winter Main **Classes:** Lecture 6 hrs/week; Tutorial 6 hrs/week; Presentation 3 hrs/week; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after the following related units INFO6007 Project Managemnet in IT and COMP5206 Introduction to Information Systems. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Block mode

This unit of study presents the leading edge of research and practice in change management and focuses on theories, frameworks and perspectives that can guide your work as a change agent in the IT industries. The unit will cover a range of approaches, methods, interventions and tools that can be used to successfully manage change projects that relate to the implementation of new technologies.

The globalisation of markets and industries, accelerating technological innovations and the need of companies to remain at the forefront of technological developments in an increasingly competitive, globalised industry have resulted in a significant increase in the speed, magnitude, and unpredictability of technological and organisational change over the last decades. Companies who have the competencies required to navigate change and overcome the inevitable obstacles to success gain a much-needed competitive edge in the marketplace. Increased globalization, economic rationalism, environmental dynamics and technological changes mean that companies, more than ever before, need to be highly flexible and adaptable to survive and thrive. Yet, a large percentage of IT projects fail to achieve the intended objectives, go over time or over budget. The capability to successfully manage organisational and technological change has become a core competency for IT professionals, business leaders and project managers.

This unit has been specifically developed for IT professionals, project managers, and senior managers to equip them with the knowledge and tools needed to ensure that IT projects remain on track to achieving the intended objectives on time and on budget. The course presents the key theories, concepts and findings in the context of academic research and change management practice. The objective is to allow participants to critically assess academic theories and methodological practice and devise interventions and actions that allow the successful management of IT initiatives.

Elective units

CISS6022
Cybersecurity

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week **Assessment:** 1x2hr exam (40%), 1x3000wd analytical Essay (40%), 1x1000wd equivalent lab exercise (10%), 1xSeminar participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The digital revolution has created new frontiers of information that influence almost every aspect of our lives. But does cyberspace also threaten our security? What are the methods and motives for attack? And how can state and non-state actors respond? Drawing on a unique combination of expertise from the Centre for International Security Studies and the School of Information Technologies, this unit introduces students to the technical and political concepts that are necessary to answer these important questions.

COMP5045
Computational Geometry

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - in class 12 hrs/week. **Assumed knowledge:** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees. **Assessment:** Through semester assessment (80%) Final Exam (20%) **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 geometric 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.

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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
Visual Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Visual Analytics aims to facilitate the data analytics process through Information Visualisation. Information Visualisation aims 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 challenge for Visual Analytics is to design and implement "effective Visualisation methods that produce pictorial representation of complex data so that data analysts from various fields (bioinformatics, social network, software visualisation and network) can visually inspect complex data and carry out critical decision making.

This unit will provide basic HCI concepts, Visualisaiton 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 Visual Analytic methods.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5313
Large Scale Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The growing connectedness of modern society translates into simplifying global communication and accelerating spread of news, information and epidemics. The focus of this unit is on the key concepts to address the challenges induced by the recent scale shift of complex networks. In particular, the course will present how scalable solutions exploiting graph theory, sociology, game theory and probability tackle the problems of communicating (routing, diffusing, aggregating) in dynamic and social networks.

COMP5318
Knowledge Discovery and Data Mining

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** INFO9120 OR COMP5138 **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 for data, by automatic and 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

COMP5338
Advanced Data Models

Credit points: 6 **Session:** Semester 2 **Classes:** Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1). **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 data storage technology. Particular emphasis is put on spatial, temporal, and NoSQL data storage. This unit extensively covers the advanced features of SQL:2003, as well as a few dominant NoSQL storage technologies. Besides in lectures, the advanced topics will be also studied with prescribed readings of database research publications.

COMP5347
Web Application Development

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week; Project Work - own time 3 hrs/week; Independent Study, **Assumed knowledge:** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5415
Multimedia Design and Authoring

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5114 or COMP9419. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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, communication and security. Specialist areas such as Picture Archiving and Communication Systems (PACS), computer-aided diagnosis (CAD), 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 Retrieval

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 retrieval techniques demanded by users to meet their information needs. This unit provides students with the most updated knowledge in order to address this issue in the context of big data, from the basics of textual information retrieval, to many advanced techniques in the field, such as large scale retrieval and social media.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

COMP5456
Introduction to Bioinformatics

This unit of study is not available in 2015

Credit points: 6 **Session:** Summer Main **Classes:** Laboratory 2 hrs/week; Lecture 2 hrs/week. **Prohibitions:** COMP3456 **Assumed knowledge:** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit brings together a wide range of skills 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. The unit covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research. It further 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.

COMP5705
Information Technology Short Project

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Late, Winter Main **Classes:** Meeting 1 hr/week; Project Work - own time, **Prohibitions:** COMP5704, COMP5703, COMP5702 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Specialist/Elective/Project

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's 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 **Prohibitions:** COMP5702, COMP5703, COMP5704 **Mode of delivery:** Supervision

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 gets split over both semester 1 and semester 2.

ELEC5507
Error Control Coding

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

IDEA9106
Design Thinking

Credit points: 6 **Teacher/Coordinator:** Dr Lian Loke **Session:** Semester 1, Semester 2 **Classes:** Lecture 1hr/wk, Tutorial 2hrs/wk **Assessment:** Design assignments (90%), Participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an overview of a human (or user) centred approach to the design of interactive technologies. It introduces students to design thinking and how it can be productively applied to different design situations. The theoretical concepts, methods and tools for the key stages of interaction design are covered including user research, ideation, prototyping and user evaluation. The cognitive processes of individual designers are also explored. Students learn to persuasively communicate and pitch design concepts with an emphasis on the user experience through visual storytelling and the use of video. It provides students with the principles, processes and tools for working on user-centred design in studio projects. Students will acquire the following learning outcomes:

1. An appreciation of the role of design thinking in traditional and cross-disciplinary contexts

2. Theoretical and practical understanding and application of human-centred methodologies, methods and tools

3. Demonstration of ideation and concept development, informed by user and background research, to innovate interactive technology solutions to complex problems

4. Awareness of design processes and cognition in collaborative, inter-disciplinary teams

5. Demonstration of persuasive oral/visual communication techniques

INFO5306
Enterprise Healthcare Info Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS). **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Healthcare systems intimately coupled to ICT have been at the forefront of many of the medical advances in modern society in the past decade. As is already the case in many other service-driven sectors, it is widely recognised that a key approach to solve some of the healthcare challenges is to harness and further ICT innovations. This unit is designed to help fill a massive technology talent gap where one of the biggest IT challenges in history is in the technology transformation of healthcare.

The unit will consist of weekly lectures, a set of group discussions (tutorials) and practical lab sessions. The contents will offer students the opportunity to develop IT knowledge and skills related to all aspects of Enterprise Healthcare Information Systems. Key Topics covered include:

* Health Information System e.g., Picture Archiving and Communication Systems (PACS) and Radiology IS

* Electronic Health Records / Personal Health Records

* Health data management

* Healthcare Transactions

* Health Statistics and Research

* Decision Support Systems including Image-based systems

* Cost Assessments and Ethics / Privacy

* TeleHealth / eHealth

* Cases studies with Australian Hospitals

Guest lecturers from the healthcare industry will be invited. The core of student's assessments will be based on individual research reports (topics related to the current industry IT needs), software / practical assignment and quizzes.

INFS6012
Enterprise Systems Management

Credit points: 6 **Teacher/Coordinator:** Jenny Leonard **Session:** Semester 1 **Classes:** 1x 3hr seminar per week **Assessment:** mid-semester test (35%), individual enterprise system portfolio (35%), and group report (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a defined elective unit of study in both the Master of Professional Accounting and the Master of Commerce programs.

This unit explores the strategic managerial issues that arise from the implementation and use of Enterprise Systems as a means of integrating data and standardising processes. The unit utilises a combination of practical sessions with an Enterprise System, such as SAP, and analyses based on readings of case studies to explore the long-term effects of strategic implementation decisions, and issues with regard to Enterprise System implementation projects. The unit explores the emergence and implications of cloud-based Enterprise Systems, and the part that Enterprise Systems play in an organisation's broader information infrastructure.

INFS6015
Business Process Management

Credit points: 6 **Teacher/Coordinator:** Olivera Marjanovic **Session:** Semester 2 **Classes:** 1x 3hr seminar per week **Assessment:** individual assignment (35%), group assignment (25%), and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an overview of the business process architecture and life cycle from a management perspective. It provides a detailed understanding of the concepts, strategies, tools and technologies required for modelling, analysis, design, improvement, integration, performance measurement and governance of business processes (both intra- and inter-enterprise) in any organisational and/or value chain context and relevant industry standards. The unit also develops practical skills in modelling, redesigning and improving business processes using various business process management software tools/suites.

INFS6016
Technology Enabled Business Innovation

Credit points: 6 **Teacher/Coordinator:** TBA **Session:** Semester 2 **Classes:** 1 x 3hr seminar per week **Assumed knowledge:** Understanding the major functions of a business and how those business functions interact internally and externally so the company can be competitive in the market is essential in order to critically analyse how and where a business can be innovative. Some knowledge of how technology can be applied in a business is also essential. Experience as a member of a project team is desirable. **Assessment:** individual research assignment (15%), individual problem-based assignment (35%), and group problem-based assignment (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit develops knowledge and skills in innovative, technology-enabled business models and strategies from a management perspective. The unit facilitates a better understanding and application of the concepts, strategies, tools and technologies necessary for undertaking business innovation. From basic knowledge of business models and essential business processes, this unit increases awareness and understanding of stakeholders, their capabilities and their limitations in the strategic convergence of technology and business. It provides insights into the technology and infrastructure required to support commerce in the 21st Century and supports development of student capabilities to analyse, develop and evaluate innovative technology-enabled business strategies and models.

INFS6018
Managing Business Intelligence

Credit points: 6 **Teacher/Coordinator:** Olivera Marjanovic **Session:** Semester 1 **Classes:** 1 x 3hr seminar per week **Assessment:** tutorial work (10%), mid-session exam (30%), practical assignment (20%), and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Business Intelligence (BI), increasingly known as Business Analytics, is a major source of competitive advantage in the Information Age and is therefore a leading business priority globally. In recent times, this field has evolved from a technology topic to a management priority, creating an unprecedented demand for new management skills. Taking a business rather than technology perspective, this unit covers all aspects of the enterprise BI ecosystem in the context of strategic and operational BI, including all five stages of BI evolution. Topics include assessment and management of organisational data quality, multidimensional data modelling and integration, management of structured and unstructured data (including those created by social media), business aspects of data warehousing, innovation through advanced analytics, BI driven performance management, business process intelligence, active enterprise intelligence, and management of complex BI projects. Access is provided to the largest world-wide community of BI academics and industry practitioners called TUN (www.TeradataUniversityNetwork.com). The hands-on experience in using a commercial BI platform, combined with in-depth analytical skills, will enable students completing the unit to help any organization (regardless of its size and industry domain) to derive more intelligence from its data and compete on analytics. This unit does not require programming experience; it is suitable for both current and aspiring BI practitioners as well as general business practitioners from any functional area interested to learn how to start and lead BI-related initiatives.

PUBH5010
Epidemiology Methods and Uses

Credit points: 6 **Teacher/Coordinator:** Professor Tim Driscoll **Session:** Semester 1 **Classes:** 1x 1hr lecture and 1x 2hr tutorial per week for 13 weeks - lectures and tutorials may be completed online **Prohibitions:** BSTA5011 **Assessment:** 1x 4page assignment (30%) and 1x 2.5hr supervised open-book exam (70%). For distance students, it may be possible to complete the exam externally with the approval of the course coordinator. **Mode of delivery:** Online

This unit provides students with core skills in epidemiology, particularly the ability to critically appraise public health and clinical epidemiological research literature. This unit covers: study types; measures of frequency and association; measurement bias; confounding/effect modification; randomized trials; systematic reviews; screening and test evaluation; infectious disease outbreaks; measuring public health impact and use and interpretation of population health data. It is expected that students spend an additional 2-3 hours at least preparing for their tutorials.

Textbooks

Webb, PW. Bain, CJ. and Pirozzo, SL. Essential Epidemiology: An Introduction for Students and Health Professionals Second Edition: Cambridge University Press 2011.

STAT5003
Computational Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Shelton Peiris **Session:** Semester 2 **Classes:** Two lectures and one tutorial per week. **Prerequisites:** STAT5002 **Assessment:** 2 hour examination (60%), assignments (20%), quizzes (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: Department permission required for enrolment.

The objectives of this unit of study are to develop an understanding of modern computationally intensive methods for statistical inference, exploratory data analysis and data mining. Advanced computational methods for statistics will be introduced, including univariate, multivariate and combinatorial optimisation methods and simulation methods, such as Gibbs sampling, the Bootstrap, Monte Carlo and the Jackknife approach. In addition, the unit will demonstrate how to apply the above techniques effectively for use on large data sets in practice. Finally, this unit will show how to make inferences about populations of interest in data mining problems.

Textbooks

Computational Statistics, Geof H. Givens, Jennifer A. Hoeting, Wiley (2005)

Foundation Units

COMP5116
Design of Networks & Distributed Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit covers general foundations of communication systems and a detailed walk through of the implementation of the TCP/IP protocol stack, which forms the basis of the Internet. The unit also covers the basic knowledge of how to analyse, design and implement simple communication protocols.

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 and design.

COMP5213
Computer and Network Organisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to computer organisation and network protocols. It covers a broad range of topics including computer hardware, software architecture (operating systems, compilers, etc), and principles of communication network protocols. It is designed to give students an understanding of how software programs operate and run inside the computer hardware, and therefore the knowledge how to use computers most effectively.

COMP9007
Algorithms

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour lectures and one 1 hour tutorial per week. **Prohibitions:** COMP5211 **Assumed knowledge:** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 computational thinking from simple list manipulation and data format conversion, up to shortest paths and cycle detection in graphs. Students will gain essential knowledge in computer science, including basic concepts in data structures, algorithms, and intractability, using paradigms such as dynamic programming, divide and conquer, greed, local search, and randomisation, as well NP-hardness.

COMP9103
Software Development in Java

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 1 hours per week **Prohibitions:** COMP5214 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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. Students will be progressively guided in 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.

COMP9110
System Analysis and Modelling

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Tutorial: 1 hours per week **Prohibitions:** : ELEC3610 OR ELEC5743 OR INFO2110 OR INFO5001 **Assumed knowledge:** Experience with a data model as in COMP9129 or COMP9103 or INFO9220 or INFO9120 or COMP5212 or COMP5214 or COMP5028 or COMP5138 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 on-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. Note: The lectures of this unit are co-taught with INFO2110.

COMP9120
Database Management Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 2 hour tutorial per week. **Prohibitions:** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content. **Assumed knowledge:** Some exposure to programming and some familiarity with data model concepts **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

Note that the first two thirds of the lectures of this foundational unit will be co-taught with the corresponding undergraduate class in semester 1 (INFO2120); tutorials and assignments will be organised separately.

COMP9220
Object-Oriented Design

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** : COMP5028 OR INFO3220 **Assumed knowledge:** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces essential object-oriented design methods and language mechanisms, especially the principles of modelling through Rational Unified Process and agile processes using Unified Modeling Language (UML) and Java or C++, both of which are industry standard. Students work in small groups to experience the process of object-oriented analysis, object-oriented design, implementation and testing by building a real-world application. Java or C++ is used as the implementation language and a special emphasis is placed on those features of Java or C++ that are important for solving real-world problems. Advanced software engineering features, including exceptions and name spaces are thoroughly covered.

INFO9117
Intro to Software Engineering Practice

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hour per week; Tutorial 2 hours per week. **Assumed knowledge:** Skill as an individual programmer (as expected from any IT graduate, who could be admitted to GCertIT, GDipIT or MIT degree) **Assessment:** Through semester assessment (50%), Final Exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is an elective for students in the postgraduate IT degrees. It is expected to be taken early in the degree if (and only if) their undergraduate education and subsequent experience have not covered this vital aspect, namely working in groups under a defined process to deliver a software development project. Remark: the USyd undergraduate degrees in IT and in SE all cover this material, especially through the unit COMP3615 or INFO3600 and INFO3402; however, not all institutions guarantee this sort of experience for IT graduates. This unit will scaffold such students to do well in future group development projects, in their coursework or in industry, by providing fundamental knowledge of Software Engineering processes and practices. Much of the student's effort will be directed towards a carefully managed small-group project to deliver a software system to meet a client's needs; they will be working with a client who may be external, or who may be a member of the teaching staff role-playing as an external client. A member of the teaching staff (separate from anyone who is acting as client) will take the role of manager for the group, checking progress and providing feedback frequently. By the end of the unit, the students will understand the processes and practices used in group projects that develop software, and they will be able to follow these processes and practices, so that they can contribute effectively in a small group that is developing software to meet clients needs.

Only one of the two units COMP9220 Object-Oriented Design or INFO9110 Systems Analysis & Modelling can be taken.

Professional Pathway Project Units

The minimum requirement for the Professional Pathway is 12 credit points of Information Technology Capstone project units. These can be completed either as the two 6 credit point units, COMP5707 and COMP5708, over two semesters, or as the 12 credit point unit, COMP5703, in one semester.

COMP5703
Information Technology Project

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 18 hours; Meeting 1 hour. **Prerequisites:** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. **Prohibitions:** : COMP5702 OR COMP5704 OR COMP5707 OR COMP5708 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

COMP5707
Information Technology Capstone A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research/Project Work 9 hrs per week; Meeting 1 hr per week. **Prohibitions:** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report. It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

COMP5708
Information Technology Capstone B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research/Project Work 9 hours per week; Meeting 1 hour per week. **Corequisites:** Corequisite: COMP5707 **Prohibitions:** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report. It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

Research Pathway units

The Research Pathway is available to candidates who achieve Distinction (75%) average results or above in their first 24 credit points of enrolment, subject to the approval of the Program Director.

COMP5702
IT Research Project A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 22 hrs/week; Meeting 2 hrs/week. **Prohibitions:** : COMP5707 OR COMP5708 OR COMP5703. **Assumed knowledge:** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Research Project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to define an original research project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent research work in a setting and manner that fosters the development of IT skills in research.

COMP5704
IT Research Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 22 hours; Meeting 2 h ours. **Prerequisites:** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take this unit. **Prohibitions:** : COMP5707 OR COMP5708 OR COMP5703. Students enrolling (and eligible) for the IT Research Project are not eligible to enrol in the IT Capstone Project Units. **Assumed knowledge:** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Research Project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to define an original research project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent research work in a setting and manner that fosters the development of IT skills in research.

INFO5993
IT Research Methods

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

For more information on units of study visit CUSP.

Master of Information Technology / Master of Information Technology Management

Course overview

The Master of Information Technology/Master of Information Technology Management prepares you for transition into management. it will equip you with an in-depth understanding of key areas such as business analytics and intelligence, IT services, management of IT innovations and change management.

While a background in computing skills is assumed, the emphasis is not on developing technical skills. The program focuses on providing a thorough and detailed understanding of the management of resources such as projects, people, knowledge and technologies.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Course structure

Whilst the completion of a major is an optional requirement of the Master of Information Technology/Master of Information Technology Management, the following majors are available:

- Biomedical and Health Informatics
- Data Analytics and Management
- Digital Media Technology
- Networks and Distributed Systems
- Software Engineering
- Telecommunications Engineering

Information Technology / Information Technology Management

Master of Information Technology / 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 2010 (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
MAINFITM1000	Master of Information Technology / 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 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 Master of Information Technology / Master of Information Technology Management requires:
(a) a Bachelor's degree or higher award in Information Technology from the University of Sydney with at least a credit average, or qualifications deemed by the School of Information Technologies to be equivalent in any aspect of Information Technology; or
(b) a Bachelor's degree or higher award in Engineering from the University of Sydney with at least a credit average and a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering, or qualifications deemed by the School of Information Technologies to be equivalent; or
(c) completion of the requirements of the Graduate Certificate or Graduate Diploma in Information Technology or Information Technology Management from the University of Sydney with at least a credit average.
(d) completion of the Graduate Diploma in Computing from the University of Sydney with at least a credit average ~~no more than 12 credit points of unit of study failed~~.
(3) If a candidate does not have a credit average within the qualifications listed above, they may be admitted to ~~the Graduate Diploma or~~ the Graduate Certificate of Information Technology or Information Technology Management subject to the discretion of the Dean or nominee.
(4) In exceptional circumstances the Dean or nominee may admit applicants without these qualifications who, in the opinion of the School of IT, 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 these awards are set out in the table of units of study: Master of Information Technology / Master of Information Technology Management.
(2) To qualify for the ~~Masters in~~ Master of Information Technology / Master of Information Technology Management a candidate must complete 96 credit points units of study as specified in the degree table including:
(a) for the Professional Pathway:
(i) 24 credit points of the Core units of study; and
(ii) a minimum of 24 credit points of the MIT Specialist units of study; and
(iii) a minimum of 24 credit points of the MITM Specialist units of study; and
(iv) a minimum of 12 credit points of the Professional Pathway Project units of study; and
(v) a maximum of 12 credit points of the Foundation units of study; and
(vi) no credit points from the Research Pathway units of study.
(b) for the Research Pathway:
(i) a minimum of 24 credit points of the Core units of study including INFO6007 and INFO5995; and
(ii) a minimum of 24 credit points of the MIT Specialist units of study; and
(iii) a minimum of 24 credit points of the MITM Specialist units of study; and
(iv) a minimum of 24 credit points of the Research Pathway units of study; and
(v) a maximum of 12 credit points of the Foundation units of study; and
(vi) no credit points from the Professional Pathway Project units of study.
(c) If a reduction in the volume of learning is given then the candidate is able to apply for an exemption onsome course requirements, if evidence can be provided of prior learning (subject to assessment by the Academic Director). The candidate will then be required to complete the required volume of learning based on the remaining course requirements.

6 Majors for the Master of Information Technology / Master of Information Technology Management

(1) Completion of a major is an optional requirement of the Master of Information Technology / Master of Information Technology Management. A major requires the completion of all core units of study as prescribed by the faculty and at least 18 credit points chosen from the Specialist units of study listed in the table for the defined major. The majors available are:
(a) Digital Media Technology
(b) Data Management and Analytics
(c) Biomedical and Health Informatics
(d) Networks and Distributed Systems
(e) Software Engineering
(f) Telecommunications Engineering

(2) Students who choose the Research Pathway will be required to choose a project undertaken in an area related to the major. Students in this category will only require 12 credit points from the Specialist units of study for the defined major.

(3) Students who choose not to complete a major as defined by the table of units of study: Master of Information Technology will be eligible for the award of a non-major.

7 Progression rules

(1) A candidate for the Master of Information Technology / Master of Information Technology Management must complete 24 credit points from Core, Specialist or Foundation units of study 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 / Master of Information Technology Management who completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take Research Path units.

8 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.

9 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.

10 Course transfer

(1) A candidate for the Master of Information Technology / Master of Information Technology Management may elect to discontinue study in the combined degree and graduate with:

(a) the Master of Information Technology or with a shorter award from the embedded sequence detailed in the course resolutions for the single degree, with the approval of the Dean in accordance with the resolutions governing that degree and provided the requirements of the shorter award have been met or;

(b) the Master of Information Technology Management alone or with a shorter award from the embedded sequence detailed in the course resolutions for the single degree, with the approval of the Dean in accordance with the resolutions governing that degree and provided the requirements of the shorter award have been met.

(2) Completion of the Master of Information Technology / Master of Information Technology Management 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 Credit for previous study (for non-conferred qualifications only)

(1) The following Coursework Rules (for non-conferred qualifications) replace the Faculty Coursework Rules for “Credit for previous study” within the “Resolutions of the Faculty (of Engineering and Information Technologies)” for the Master of Information Technology / Master of Information Technology Management:

(a) where postgraduate study has been undertaken at the University of Sydney in one of the embedded courses of the Master of Information Technology or Master of Information Technology Management~~ or the Graduate Diploma in Computing~~ and no award has been conferred, credit may be transferred in full (subject to credit limits in the table of units of study: Master of Information Technology / Master of Information Technology Management), provided the study has been undertaken within the previous three years and subject to approval of the Academic Director. In addition, a credit transfer for the purposes of a course upgrade will require either:

(i) fulfilment of the admission requirements for the “Admission to Candidature” for the Master of Information Technology / Master of Information Technology Management including at least a credit average from the prior qualification used for admission; or

(ii) completion of a minimum of 24 credit points of the currently enrolled course with at least a credit average;

(b) A candidate for the Graduate Diploma in Computing may transfer to the Master of Information Technology/Master of Information Technology Management upon completion of a minimum of 24 credit points with a credit average, subject to the approval of the Academic Director, with the following conditions:

(I) credit may not be transferred from the first 24 credit points of study of the Graduate Diploma in Computing;

(II) credit after the first 24 credit points in the Graduate Diploma in Computing may be transferred in full (subject to credit limits in the table of units of study: Master of Information Technology/Master of Information Technology Management);

(III) the study has been undertaken within the previous three years;

(IV) no award has been conferred.

(c) where study not covered in (a) or (b) above 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 Master of Information Technology / Master of Information Technology Management, 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.

(d) Credit will not be granted for recognised prior learning older than 10 years at the time of first enrolment.

12 Recognition for Prior Learning~~Reduction of the Volume of Learning~~ (for conferred qualifications only)

(1) The following Coursework Rules (for conferred qualifications) replace the Faculty Coursework Rules for “Credit for previous study” within the “Resolutions of the Faculty (of Engineering and Information Technologies)” for the Master of Information Technology / Master of Information Technology Management:

(a) where study has been undertaken and an award has been conferred, candidates who are offered direct admission to the Master of Information Technology / Master of Information Technology Management may be eligible for a reduction in the volume of learning of up to 36 credit points provided that study for the conferred award has been undertaken at an external institution recognized by the University of Sydney, within the previous three years. Any reduction in the volume of learning is subject to the following guidelines and requires the approval of the Academic Director:

(i) the maximum permissible reduction in the volume of learning is 36 credit points for a master's degree (at level 9 of the Australian Qualifications Framework) in the discipline of Information Technology, as defined by the School of IT.

(ii) the maximum permissible reduction in the volume of learning is 24 credit points for a bachelor's degree with Honours (at level 8 of the Australian Qualifications Framework) in the discipline of Information Technology, as defined by the School of IT.

(iii) the maximum permissible reduction in the volume of learning is 24 credit points for a bachelor's degree with Honours (at level 8 of the Australian Qualifications Framework) in the discipline of Engineering, as defined by the School of IT, with a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering.

(iv) the maximum permissible reduction in the volume of learning is 12 credit points for a Graduate Diploma (at level 8 of the Aust

(v) the maximum permissible reduction in the volume of learning is 12 credit points for a four year Bachelor of Information Technology (pass) only at the University of Sydney (at level 7 of the Australian Qualifications Framework).

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 or Information Technology Management, depending on the credit points successfully completed.

14 Time limit

A candidate for the Master of Information Technology / Master of Information Technology Management shall complete the requirements for the award in a minimum of three~~four~~ semesters and a maximum of sixteen semesters.

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Information Technology / Master of Information Technology Management			
Candidates for the degree of Master of Information Technology/ Master of Information Technology Management are required to complete 96 credit points from the units of study listed in the tables below as follows: 1. a total of 96 credit points 2. a minimum of 24 credit points of the Core units of study 3. a minimum of 24 credit points of the Information Technology Specialist units of study 4. a minimum of 24 credit points of the Information Technology Management Specialist units of study 5. a maximum of 12 credit points of the Foundation units of study.			
The completion of a major is an optional requirement of this degree. A major requires the completion of all core units of study and at least 18 credit points chosen from the Information Technology Specialist units of study listed in the table for the defined major, as below.			
6. A maximum of 12 credit points may be selected from units outside of the School of Information Technology, with the approval of the Program Director. For the Professional Pathway, after completing 24 credit points of coursework, in addition to the requirements listed above, select: 1. a minimum of 12 credit points of the Professional Pathway Project units of study, 2. no credit points from the research pathway units of study. Students may gain admission to the Research Pathway after completing 24 credit points of coursework with a Distinction average or above, subject to the approval of the Program Director. For the Research Pathway, in addition to the requirements listed above, select: 1. a minimum of 24 credit points of the Research Pathway units of study, 2. no credit points from the Professional Pathway Project units of study.			
Core units			
Candidates for the Master of Information Technology/Master of Information Technology Management must complete a minimum of 24 credit points from the listed Core units of study.			
COMP5206 **Information Technologies and Systems**	6		Semester 1 Semester 2
INFO5990 **Professional Practice in IT**	6	**A** Students enrolled in INFO5990 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have many years experience as a practising IT professional. *The main focus of the subject is to provide students with the necessary tools, basic skills, experience and adequate knowledge so they develop an awareness and an understanding of the responsibilities and issues associated with professional conduct and practice in the information technology sector.*	Semester 1 Semester 2
INFO5992 **Understanding IT Innovations**	6	**A** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **N** PMGT5875 *A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.*	Semester 1 Semester 2
INFO6007 **Project Management in IT**	6	**A** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **N** PMGT5871	Semester 1 Semester 2
Information Technology Specialist Units			
Candidates for the Master of Information Technology/Master of Information Technology Management must complete a minimum of 24 credit points from the listed Information Technology Specialist units of study.			
CISS6022 **Cybersecurity**	6		Semester 1
COMP5045 **Computational Geometry**	6	**A** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees.	Semester 1
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5048 **Visual Analytics**	6	**A** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills.	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5313 **Large Scale Networks**	6	**A** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. *Note: Department permission required for enrolment*	Semester 1
COMP5318 **Knowledge Discovery and Data Mining**	6	**A** INFO9120 OR COMP5138	Semester 1
COMP5338 **Advanced Data Models**	6	**A** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1).	Semester 2
COMP5347 **Web Application Development**	6	**A** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams.	Semester 1
COMP5348 **Enterprise Scale Software Architecture**	6	**A** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.	Semester 1
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1
COMP5415 **Multimedia Design and Authoring**	6	**A** COMP5114 or COMP9419.	Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
COMP5424 **Information Technology in Biomedicine**	6		Semester 1
COMP5425 **Multimedia Retrieval**	6	**A** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge.	Semester 1
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	Semester 1
COMP5427 **Usability Engineering**	6		Semester 2
COMP5456 **Introduction to Bioinformatics** *This unit of study is not available in 2015*	6	**A** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **N** COMP3456	Summer Main
ELEC5507 **Error Control Coding**	6	**A** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired.	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
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.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	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) **N** MECH5701	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2
IDEA9106 **Design Thinking**	6		Semester 1 Semester 2
INFO5010 **IT Advanced Topic A**	6	*Note: Department permission required for enrolment*	Semester 1 Semester 2 Summer Late
INFO5011 **IT Advanced Topic B** *This unit of study is not available in 2015*	6	**N** INFO4011	Semester 1 Semester 2 Winter Main
INFO5060 **Data Analytics and Business Intelligence**	6	**A** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems	Summer Early

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
INFO5301 **Information Security Management**	6	**A** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable.	Semester 1
INFO5306 **Enterprise Healthcare Info Systems**	6	**A** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS).	Semester 2
INFO6010 **Advanced Topics in IT Project Management**	6	**A** Students are assumed to understand the role of IT projects. **P** INFO6007, OR 3-5 years working experience in IT Project Management	Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.	Semester 1
PUBH5010 **Epidemiology Methods and Uses**	6	**N** BSTA5011	Semester 1
STAT5003 **Computational Statistical Methods**	6	**P** STAT5002 *Note: Department permission required for enrolment*	Semester 2
Information Technology Management Specialist units			
Candidates for the Master of Information Technology/Master of Information Technology Management must complete a minimum of 24 credit points from the listed Information Technology Management Specialist units of study.			
INFO5060 **Data Analytics and Business Intelligence**	6	**A** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems	Summer Early
INFO5301 **Information Security Management**	6	**A** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable.	Semester 1
INFO5991 **Services Science Management and Eng**	6	**A** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business. *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO6010 **Advanced Topics in IT Project Management**	6	**A** Students are assumed to understand the role of IT projects. **P** INFO6007, OR 3-5 years working experience in IT Project Management	Semester 2
INFO6012 **Information Technology Strategy & Value**	6	**A** COMP5206. Introduction to Information Systems	Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.	Semester 1
ISYS5070 **Change Management in IT**	6	**A** The unit is expected to be taken after the following related units INFO6007 Project Managemnet in IT and COMP5206 Introduction to Information Systems.	Winter Main
Foundation units			
Candidates must complete a maximum of 12 credit points from the listed Foundation units.			
COMP5116 **Design of Networks & Distributed Systems**	6		Semester 2
COMP5213 **Computer and Network Organisation**	6		Semester 1
COMP9007 **Algorithms**	6	**A** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **N** COMP5211	Semester 2
COMP9103 **Software Development in Java**	6	**N** COMP5214	Semester 1 Semester 2
COMP9110 **System Analysis and Modelling**	6	**A** Experience with a data model as in COMP9129 or COMP9103 or INFO9220 or INFO9120 or COMP5212 or COMP5214 or COMP5028 or COMP5138 **N** : ELEC3610 OR ELEC5743 OR INFO2110 OR INFO5001	Semester 2
COMP9120 **Database Management Systems**	6	**A** Some exposure to programming and some familiarity with data model concepts **N** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content.	Semester 1 Semester 2
COMP9220 **Object-Oriented Design**	6	**A** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **N** : COMP5028 OR INFO3220	Semester 1
COMP9419 **Digital Media Fundamentals**	6	**N** COMP5114	Semester 1
INFO9003 **IT for Health Professionals**	6	**N** INFO5003 *Note: Department permission required for enrolment*	Semester 2
INFO9117 **Intro to Software Engineering Practice**	6	**A** Skill as an individual programmer (as expected from any IT graduate, who could be admitted to GCertIT, GDipIT or MIT degree)	Semester 1 Semester 2
PUBH5018 **Introductory Biostatistics**	6		Semester 1
STAT5002 **Introduction to Statistics**	6	**A** HSC Mathematics	Semester 1
Elective Units			
Candidates may complete a maximum of 12 credit points from the listed Elective units.			

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5705 **Information Technology Short Project**	6	**N** COMP5704, COMP5703, COMP5702 *Specialist/Elective/Project*	Semester 1 Semester 2 Summer Late Winter Main
COMP5706 **IT Industry Placement Project**	6	**N** COMP5702, COMP5703, COMP5704	Semester 1 Semester 2
INFS6012 **Enterprise Systems Management**	6	*This is a defined elective unit of study in both the Master of Professional Accounting and the Master of Commerce programs.*	Semester 1
INFS6015 **Business Process Management**	6		Semester 2
INFS6016 **Technology Enabled Business Innovation**	6	**A** Understanding the major functions of a business and how those business functions interact internally and externally so the company can be competitive in the market is essential in order to critically analyse how and where a business can be innovative. Some knowledge of how technology can be applied in a business is also essential. Experience as a member of a project team is desirable.	Semester 2
INFS6018 **Managing Business Intelligence**	6		Semester 1

Professional Pathway units

The minimum requirement for the Professional Pathway is 12 credit points of Information Technology Capstone Project units. Candidates can complete either COMP5770 and COMP5708 (6 & 6 credit points over two semesters) or COMP5703 (12 credit points in one semester).

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5703 **Information Technology Project**	12	**P** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. **N** : COMP5702 OR COMP5704 OR COMP5707 OR COMP5708	Semester 1 Semester 2
COMP5707 **Information Technology Capstone A**	6	**N** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2
COMP5708 **Information Technology Capstone B**	6	**C** Corequisite: COMP5707 **N** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2

Research Pathway units

Candidates in the Research Pathway must take all 24 credit points of the Research Pathway units of study in the table below.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5702 **IT Research Project A**	12	**A** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **N** : COMP5707 OR COMP5708 OR COMP5703. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2
COMP5704 **IT Research Project B**	6	**A** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **P** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take this unit. **N** : COMP5707 OR COMP5708 OR COMP5703. Students enrolling (and eligible) for the IT Research Project are not eligible to enrol in the IT Capstone Project Units. *A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.*	Semester 1 Semester 2
INFO5993 **IT Research Methods**	6		Semester 1 Semester 2

Majors for the Master of Information Technology/Master of Information Technology Management

The completion of a major is an optional requirement of this degree. The award of a major requires the completion of 18 credit points of Information Technology Specialist units listed under the relevant major.

Biomedical and Health Informatics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5424 **Information Technology in Biomedicine**	6		Semester 1
COMP5427 **Usability Engineering**	6		Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5456 **Introduction to Bioinformatics** *This unit of study is not available in 2015*	6	**A** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **N** COMP3456	Summer Main
INFO5306 **Enterprise Healthcare Info Systems**	6	**A** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS).	Semester 2
PUBH5010 **Epidemiology Methods and Uses**	6	**N** BSTA5011	Semester 1
Data Management and Analytics			
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5048 **Visual Analytics**	6	**A** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills.	Semester 2
COMP5318 **Knowledge Discovery and Data Mining**	6	**A** INFO9120 OR COMP5138	Semester 1
COMP5338 **Advanced Data Models**	6	**A** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1).	Semester 2
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1
COMP5425 **Multimedia Retrieval**	6	**A** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge.	Semester 1
INFO5060 **Data Analytics and Business Intelligence**	6	**A** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems	Summer Early
ISYS5050 **Knowledge Management Systems**	6	**A** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.	Semester 1
STAT5003 **Computational Statistical Methods**	6	**P** STAT5002 *Note: Department permission required for enrolment*	Semester 2
Digital Media Technology			
CISS6022 **Cybersecurity**	6		Semester 1
COMP5045 **Computational Geometry**	6	**A** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees.	Semester 1
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5048 **Visual Analytics**	6	**A** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills.	Semester 2
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5347 **Web Application Development**	6	**A** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams.	Semester 1
COMP5415 **Multimedia Design and Authoring**	6	**A** COMP5114 or COMP9419.	Semester 2
COMP5425 **Multimedia Retrieval**	6	**A** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge.	Semester 1
COMP5427 **Usability Engineering**	6		Semester 2
IDEA9106 **Design Thinking**	6		Semester 1 Semester 2
Networks and Distributed Systems			
CISS6022 **Cybersecurity**	6		Semester 1
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5313 **Large Scale Networks**	6	**A** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. *Note: Department permission required for enrolment*	Semester 1
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	Semester 1
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
Software Engineering			
CISS6022 **Cybersecurity**	6		Semester 1
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5347 **Web Application Development**	6	**A** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams.	Semester 1
COMP5348 **Enterprise Scale Software Architecture**	6	**A** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.	Semester 1
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1
COMP5427 **Usability Engineering**	6		Semester 2
ELEC5616 **Computer and Network Security**	6	**A** A programming language, basic maths.	Semester 1
ELEC5618 **Software Quality Engineering**	6	**A** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive.	Semester 1
ELEC5619 **Object Oriented Application Frameworks**	6	**A** Java programming, and some web development experience are essential. Databases strongly recommended	Semester 2
ELEC5620 **Model Based Software Engineering**	6	**A** A programming language, basic maths. *Note: Department permission required for enrolment*	Semester 2
ELEC5622 **Signals, Software and Health**	6	*Note: Department permission required for enrolment*	Semester 2
Telecommunications Engineering			
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
ELEC5507 **Error Control Coding**	6	**A** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired.	Semester 1
ELEC5508 **Wireless Engineering**	6	**A** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.	Semester 2
ELEC5509 **Mobile Networks**	6	**A** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in one the following units of study: ELEC3505 Communications, ELEC3506 Data Communications and the Internet, or similar units. If you are not sure, please contact the instructor.	Semester 1
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.	Semester 2
ELEC5511 **Optical Communication Systems**	6	**A** ELEC3505 and ELEC3405 -	Semester 1
ELEC5512 **Optical Networks**	6	**A** Knowledge of digital communications, wave propagation, and fundamental optics	Semester 2

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Information Technology / Master of Information Technology Management

Candidates for the degree of Master of Information Technology/ Master of Information Technology Management are required to complete 96 credit points from the units of study listed in the tables below as follows:1. a total of 96 credit points2. a minimum of 24 credit points of the Core units of study3. a minimum of 24 credit points of the Information Technology Specialist units of study4. a minimum of 24 credit points of the Information Technology Management Specialist units of study5. a maximum of 12 credit points of the Foundation units of study.The completion of a major is an optional requirement of this degree. A major requires the completion of all core units of study and at least 18 credit points chosen from the Information Technology Specialist units of study listed in the table for the defined major, as below.6. A maximum of 12 credit points may be selected from units outside of the School of Information Technology, with the approval of the Program Director.For the Professional Pathway, after completing 24 credit points of coursework, in addition to the requirements listed above, select:1. a minimum of 12 credit points of the Professional Pathway Project units of study,2. no credit points from the research pathway units of study.Students may gain admission to the Research Pathway after completing 24 credit points of coursework with a Distinction average or above, subject to the approval of the Program Director. For the Research Pathway, in addition to the requirements listed above, select:1. a minimum of 24 credit points of the Research Pathway units of study,2. no credit points from the Professional Pathway Project units of study.

Core units

Candidates for the Master of Information Technology/Master of Information Technology Management must complete a minimum of 24 credit points from the listed Core units of study.

COMP5206
Information Technologies and Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive introduction to the field of information systems from organisational and managerial perspectives. The emergence of the digital firm and its implications will be studied. The critical role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Key topics covered will include:

*Basic Information Systems Concepts

*Systems Approach and Systems Thinking

*E-Business and E-Commerce

*IT Strategy and Competitive Advantage

*Data and Knowledge Management

*Information Systems Development and IS Management

*Decision support systems, business intelligence and online analytical processing systems (OLAP)

*Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems, Enterprise Content Management and Supply Chain Management (SCM) systems

*Ethical, Legal and Social Aspects of Information technologis.

INFO5990
Professional Practice in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Students enrolled in INFO5990 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have many years experience as a practising IT professional. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: The main focus of the subject is to provide students with the necessary tools, basic skills, experience and adequate knowledge so they develop an awareness and an understanding of the responsibilities and issues associated with professional conduct and practice in the information technology sector.

This Unit of Study introduces the students to some of the concepts, standards and techniques associated with the current professional practice in information technology in the business environment.

Students will encounter a range of concepts, techniques and professional issues including interpersonal and organisational communication, human resources and conflict resolution, globalisation, professional ethics, social impacts of IT, data security, data quality assurance, system audit, investigative research and project management practice. Practical and real world case studies will be used as part of the learning to enhance the in-class teachings to the needs of industry.

INFO5992
Understanding IT Innovations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prohibitions:** PMGT5875 **Assumed knowledge:** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.

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.

INFO6007
Project Management in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture Workshop 3 hrs/week; WeeklyAssignments 5 hrs; Exam Preparation 16 hrs. **Prohibitions:** PMGT5871 **Assumed knowledge:** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **Assessment:**

Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers the factors necessary for successful management of a wide variety of Information Technology projects. The course covers both quantitative and qualitative aspects of project management. Topics include the management of time, scope, budget, risk, quality, and resources through each of the phases of a project.

Information Technology Specialist Units

Candidates for the Master of Information Technology/Master of Information Technology Management must complete a minimum of 24 credit points from the listed Information Technology Specialist units of study.

CISS6022
Cybersecurity

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week **Assessment:** 1x2hr exam (40%), 1x3000wd analytical Essay (40%), 1x1000wd equivalent lab exercise (10%), 1xSeminar participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The digital revolution has created new frontiers of information that influence almost every aspect of our lives. But does cyberspace also threaten our security? What are the methods and motives for attack? And how can state and non-state actors respond? Drawing on a unique combination of expertise from the Centre for International Security Studies and the School of Information Technologies, this unit introduces students to the technical and political concepts that are necessary to answer these important questions.

COMP5045
Computational Geometry

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - in class 12 hrs/week. **Assumed knowledge:** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees. **Assessment:** Through semester assessment (80%) Final Exam (20%) **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 geometric 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.

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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
Visual Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Visual Analytics aims to facilitate the data analytics process through Information Visualisation. Information Visualisation aims 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 challenge for Visual Analytics is to design and implement "effective Visualisation methods that produce pictorial representation of complex data so that data analysts from various fields (bioinformatics, social network, software visualisation and network) can visually inspect complex data and carry out critical decision making.

This unit will provide basic HCI concepts, Visualisaiton 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 Visual Analytic methods.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5313
Large Scale Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The growing connectedness of modern society translates into simplifying global communication and accelerating spread of news, information and epidemics. The focus of this unit is on the key concepts to address the challenges induced by the recent scale shift of complex networks. In particular, the course will present how scalable solutions exploiting graph theory, sociology, game theory and probability tackle the problems of communicating (routing, diffusing, aggregating) in dynamic and social networks.

COMP5318
Knowledge Discovery and Data Mining

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** INFO9120 OR COMP5138 **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 for data, by automatic and 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

COMP5338
Advanced Data Models

Credit points: 6 **Session:** Semester 2 **Classes:** Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1). **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 data storage technology.

Particular emphasis is put on spatial, temporal, and NoSQL data storage. This unit extensively covers the advanced features of SQL:2003, as well as a few dominant NoSQL storage technologies. Besides in lectures, the advanced topics will be also studied with prescribed readings of database research publications.

COMP5347
Web Application Development

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week; Project Work - own time 3 hrs/week; Independent Study, **Assumed knowledge:** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5415
Multimedia Design and Authoring

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5114 or COMP9419. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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, communication and security. Specialist areas such as Picture Archiving and Communication Systems (PACS), computer-aided diagnosis (CAD), 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 Retrieval

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 retrieval techniques demanded by users to meet their information needs. This unit provides students with the most updated knowledge in order to address this issue in the context of big data, from the basics of textual information retrieval, to many advanced techniques in the field, such as large scale retrieval and social media.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

COMP5456
Introduction to Bioinformatics

This unit of study is not available in 2015

Credit points: 6 **Session:** Summer Main **Classes:** Laboratory 2 hrs/week; Lecture 2 hrs/week. **Prohibitions:** COMP3456 **Assumed knowledge:** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit brings together a wide range of skills 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. The unit covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research. It further 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.

ELEC5507
Error Control Coding

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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.

ELEC5614
Real Time Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - own time 2 hrs; Lecture 2 hrs/week; Laboratory 2 hrs/week; Tutorial 1 hr/week; E-Learning 1 hr. **Prohibitions:** MECH5701 **Assumed knowledge:** SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files.You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

IDEA9106
Design Thinking

Credit points: 6 **Teacher/Coordinator:** Dr Lian Loke **Session:** Semester 1, Semester 2 **Classes:** Lecture 1hr/wk, Tutorial 2hrs/wk **Assessment:** Design assignments (90%), Participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an overview of a human (or user) centred approach to the design of interactive technologies. It introduces students to design thinking and how it can be productively applied to different design situations. The theoretical concepts, methods and tools for the key stages of interaction design are covered including user research, ideation, prototyping and user evaluation. The cognitive processes of individual designers are also explored. Students learn to persuasively communicate and pitch design concepts with an emphasis on the user experience through visual storytelling and the use of video. It provides students with the principles, processes and tools for working on user-centred design in studio projects. Students will acquire the following learning outcomes:

1. An appreciation of the role of design thinking in traditional and cross-disciplinary contexts

2. Theoretical and practical understanding and application of human-centred methodologies, methods and tools

3. Demonstration of ideation and concept development, informed by user and background research, to innovate interactive technology solutions to complex problems

4. Awareness of design processes and cognition in collaborative, inter-disciplinary teams

5. Demonstration of persuasive oral/visual communication techniques

INFO5010
IT Advanced Topic A

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Late **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

This unit of study is not available in 2015

Credit points: 6 **Session:** Semester 1, Semester 2, Winter Main **Classes:** One 2 hour scheduled small-group class per week. **Prohibitions:** INFO4011 **Assessment:** Through session assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

INFO5060
Data Analytics and Business Intelligence

Credit points: 6 **Session:** Summer Early **Classes:** Lecture 4 hrs; Tutorial 2 hrs; Laboratory 6 hrs; Presentation 3 hrs; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Block mode

The frontier for using data to make decisions has shifted dramatically. High performing enterprises are now building their competitive strategies around data-driven insights that in turn generate impressive business results. This course provides an overview of Business Intelligence (BI) concepts, technologies and practices, and then focuses on the application of BI through a team based project simulation that will allow students to have practical experience in building a BI solution based on a real world case study.

INFO5301
Information Security Management

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study gives a broad view of the management aspects of information security. We emphasise corporate governance for information security, organisational structures within which information security is managed, risk assessment, and control structures. Planning for security, and regulatory issues, are also addressed.

INFO5306
Enterprise Healthcare Info Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS). **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Healthcare systems intimately coupled to ICT have been at the forefront of many of the medical advances in modern society in the past decade. As is already the case in many other service-driven sectors, it is widely recognised that a key approach to solve some of the healthcare challenges is to harness and further ICT innovations. This unit is designed to help fill a massive technology talent gap where one of the biggest IT challenges in history is in the technology transformation of healthcare.

The unit will consist of weekly lectures, a set of group discussions (tutorials) and practical lab sessions. The contents will offer students the opportunity to develop IT knowledge and skills related to all aspects of Enterprise Healthcare Information Systems. Key Topics covered include:

* Health Information System e.g., Picture Archiving and Communication Systems (PACS) and Radiology IS

* Electronic Health Records / Personal Health Records

* Health data management

* Healthcare Transactions

* Health Statistics and Research

* Decision Support Systems including Image-based systems

* Cost Assessments and Ethics / Privacy

* TeleHealth / eHealth

* Cases studies with Australian Hospitals

Guest lecturers from the healthcare industry will be invited. The core of student's assessments will be based on individual research reports (topics related to the current industry IT needs), software / practical assignment and quizzes.

INFO6010
Advanced Topics in IT Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial (applied workshop) 1 hr/week; E-Learning 1 hr/week. **Prerequisites:** INFO6007, OR 3-5 years working experience in IT Project Management **Assumed knowledge:** Students are assumed to understand the role of IT projects. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the limitations of IT project management and the most promising techniques to overcome project failure. It will start by reviewing case study research showing we have reached the limits of traditional IT project management practice. The theoretical base will be completed by exploring the finding that senior management have more impact on success than traditional approaches.

Participants will be introduced to and learn to apply the most promising tools and techniques needed to govern IT projects. The topics reviewed will include:

1)strategy,

2)organisational change,

3)project sponsorship,

4)programme management,

5)performance measurement,

6)culture

7)portfolio management.

8)Relevant Australian and International Standards on IT/Project Governance and new industry methodologies around portfolio, programme and change management will be reviewed.

ISYS5050
Knowledge Management Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** An undergraduate degree in Computer

Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The need to track and facilitate the sharing of the core knowledge resources in contemporary organisations is widely recognised. This course will provide a comprehensive introduction to the emerging area of Knowledge Management (KM) from both technological and organisational perspectives. We will review and discuss a range of published papers, case studies, and other publications that deal with a range of important KM-related topics. One of the key knowledge management technologies, Business Intelligence Systems, will be covered in detail. It will also include hands-on work using the BI (Online Analytical Processing - OLAP) tool, COGNOS.

Some of the main themes to be covered will include:

oKM: Conceptual Foundations

oTaxonomies of organizational knowledge and KM mechanisms

oCase/Field Studies of KM Initiatives

o Data Warehousing and OLAP/Business Analytics

oData, text, and web mining.

oSocial media,crowdsourcing, an KM

PUBH5010
Epidemiology Methods and Uses

Credit points: 6 **Teacher/Coordinator:** Professor Tim Driscoll **Session:** Semester 1 **Classes:** 1x 1hr lecture and 1x 2hr tutorial per week for 13 weeks - lectures and tutorials may be completed online **Prohibitions:** BSTA5011 **Assessment:** 1x 4page assignment (30%) and 1x 2.5hr supervised open-book exam (70%). For distance students, it may be possible to complete the exam externally with the approval of the course coordinator. **Mode of delivery:** Online

This unit provides students with core skills in epidemiology, particularly the ability to critically appraise public health and clinical epidemiological research literature. This unit covers: study types; measures of frequency and association; measurement bias; confounding/effect modification; randomized trials; systematic reviews; screening and test evaluation; infectious disease outbreaks; measuring public health impact and use and interpretation of population health data. It is expected that students spend an additional 2-3 hours at least preparing for their tutorials.

Textbooks

Webb, PW. Bain, CJ. and Pirozzo, SL. Essential Epidemiology: An Introduction for Students and Health Professionals Second Edition: Cambridge University Press 2011.

STAT5003
Computational Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Shelton Peiris **Session:** Semester 2 **Classes:** Two lectures and one tutorial per week. **Prerequisites:** STAT5002 **Assessment:** 2 hour examination (60%), assignments (20%), quizzes (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: Department permission required for enrolment.

The objectives of this unit of study are to develop an understanding of modern computationally intensive methods for statistical inference, exploratory data analysis and data mining. Advanced computational methods for statistics will be introduced, including univariate, multivariate and combinatorial optimisation methods and simulation methods, such as Gibbs sampling, the Bootstrap, Monte Carlo and the Jackknife approach. In addition, the unit will demonstrate how to apply the above techniques effectively for use on large data sets in practice. Finally, this unit will show how to make inferences about populations of interest in data mining problems.

Textbooks

Computational Statistics, Geof H. Givens, Jennifer A. Hoeting, Wiley (2005)

Information Technology Management Specialist units

Candidates for the Master of Information Technology/Master of Information Technology Management must complete a minimum of 24 credit points from the listed Information Technology Management Specialist units of study.

INFO5060
Data Analytics and Business Intelligence

Credit points: 6 **Session:** Summer Early **Classes:** Lecture 4 hrs; Tutorial 2 hrs; Laboratory 6 hrs; Presentation 3 hrs; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Block mode

The frontier for using data to make decisions has shifted dramatically. High performing enterprises are now building their competitive strategies around data-driven insights that in turn generate impressive business results. This course provides an overview of Business Intelligence (BI) concepts, technologies and practices, and then focuses on the application of BI through a team based project simulation that will allow students to have practical experience in building a BI solution based on a real world case study.

INFO5301
Information Security Management

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study gives a broad view of the management aspects of information security. We emphasise corporate governance for information security, organisational structures within which information security is managed, risk assessment, and control structures. Planning for security, and regulatory issues, are also addressed.

INFO5991
Services Science Management and Eng

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Seminar 2 hrs/week. **Assumed knowledge:** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The service economy plays a dominant and growing role in growth and employment in most parts of the world. Increasingly, the improved productivity and competitive performance of firms and nations in the services arena relies on innovative and effective design, engineering and management of IT-centric services. In response to industry needs, this unit offers IT professionals a social, economic and technical perspective of service-oriented IT.

INFO6010
Advanced Topics in IT Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial (applied workshop) 1 hr/week; E-Learning 1 hr/week. **Prerequisites:** INFO6007, OR 3-5 years working experience in IT Project Management **Assumed knowledge:** Students are assumed to understand the role of IT projects. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the limitations of IT project management and the most promising techniques to overcome project failure. It will start by reviewing case study research showing we have reached the limits of traditional IT project management practice. The theoretical base will be completed by exploring the finding that senior management have more impact on success than traditional approaches.

Participants will be introduced to and learn to apply the most promising tools and techniques needed to govern IT projects. The topics reviewed will include:

1)strategy,

2)organisational change,

3)project sponsorship,

4)programme management,

5)performance measurement,

6)culture

7)portfolio management.

8)Relevant Australian and International Standards on IT/Project Governance and new industry methodologies around portfolio, programme and change management will be reviewed.

INFO6012
Information Technology Strategy & Value

Credit points: 6 **Session:** Semester 2 **Classes:** Flexible Session 3 hrs/week. **Assumed knowledge:** COMP5206. Introduction to Information Systems **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The increasingly strategic role of IT in organisations is widely recognised. This unit of study is designed to provide a comprehensive introduction to strategic aspects of IT as they impact on business value. Such a perspective is critical for IT professionals in both IT producer and user organisations from the level of Chief Information Officer to managers as well as technical specialists. Deep understanding of IT strategy formulation and implementation and ensuring its alignment with the organisation's strategic directions is important for successfully managing the major changes that the IT function has undergone in recent years.

Topics covered will include technology forecasting and assessment of IT impacts, achieving sustainable competitive through IT, relationship between IT strategy and value, IT strategy formulation and implementation, evaluation of strategic investments in IT, IT portfolio management, IT souring and open innovation, and dynamics of IT strategy and game theory. It will explore IT-related strategic decision making at the different organisational levels and the concept of strategic congruence. This unit will provide students with models, tools, and techniques to evaluate an organisation's IT strategic position, and hence to help make appropriate strategic choices.

ISYS5050
Knowledge Management Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The need to track and facilitate the sharing of the core knowledge resources in contemporary organisations is widely recognised. This course will provide a comprehensive introduction to the emerging area of Knowledge Management (KM) from both technological and organisational perspectives. We will review and discuss a range of published papers, case studies, and other publications that deal with a range of important KM-related topics. One of the key knowledge management technologies, Business Intelligence Systems, will be covered in detail. It will also include hands-on work using the BI (Online Analytical Processing - OLAP) tool, COGNOS.

Some of the main themes to be covered will include:

oKM: Conceptual Foundations

oTaxonomies of organizational knowledge and KM mechanisms

oCase/Field Studies of KM Initiatives

o Data Warehousing and OLAP/Business Analytics

oData, text, and web mining.

oSocial media,crowdsourcing, an KM

ISYS5070
Change Management in IT

Credit points: 6 **Session:** Winter Main **Classes:** Lecture 6 hrs/week; Tutorial 6 hrs/week; Presentation 3 hrs/week; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after the following related units INFO6007 Project Managemnet in IT and COMP5206 Introduction to Information Systems. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Block mode

This unit of study presents the leading edge of research and practice in change management and focuses on theories, frameworks and perspectives that can guide your work as a change agent in the IT industries. The unit will cover a range of approaches, methods, interventions and tools that can be used to successfully manage change projects that relate to the implementation of new technologies.

The globalisation of markets and industries, accelerating technological innovations and the need of companies to remain at the forefront of technological developments in an increasingly competitive, globalised industry have resulted in a significant increase in the speed, magnitude, and unpredictability of technological and organisational change over the last decades. Companies who have the competencies required to navigate change and overcome the inevitable obstacles to success gain a much-needed competitive edge in the marketplace. Increased globalization, economic rationalism, environmental dynamics and technological changes mean that companies, more than ever before, need to be highly flexible and adaptable to survive and thrive. Yet, a large percentage of IT projects fail to achieve the intended objectives, go over time or over budget. The capability to successfully manage organisational and technological change has become a core competency for IT professionals, business leaders and project managers.

This unit has been specifically developed for IT professionals, project managers, and senior managers to equip them with the knowledge and tools needed to ensure that IT projects remain on track to achieving the intended objectives on time and on budget. The course presents the key theories, concepts and findings in the context of academic research and change management practice. The objective is to allow participants to critically assess academic theories and methodological practice and devise interventions and actions that allow the successful management of IT initiatives.

Foundation units

Candidates must complete a maximum of 12 credit points from the listed Foundation units.

COMP5116
Design of Networks & Distributed Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit covers general foundations of communication systems and a detailed walk through of the implementation of the TCP/IP protocol stack, which forms the basis of the Internet. The unit also covers the basic knowledge of how to analyse, design and implement simple communication protocols.

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 and design.

COMP5213
Computer and Network Organisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to computer organisation and network protocols. It covers a broad range of topics including computer hardware, software architecture (operating systems, compilers, etc), and principles of communication network protocols. It is designed to give students an understanding of how software programs operate and run inside the computer hardware, and therefore the knowledge how to use computers most effectively.

COMP9007
Algorithms

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour lectures and one 1 hour tutorial per week. **Prohibitions:** COMP5211 **Assumed knowledge:** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 computational thinking from simple list manipulation and data format conversion, up to shortest paths and cycle detection in graphs. Students will gain essential knowledge in computer science, including basic concepts in data structures, algorithms, and intractability, using paradigms such as dynamic programming, divide and conquer, greed, local search, and randomisation, as well NP-hardness.

COMP9103
Software Development in Java

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 1 hours per week **Prohibitions:** COMP5214 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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. Students will be progressively guided in 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.

COMP9110
System Analysis and Modelling

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Tutorial: 1 hours per week **Prohibitions:** : ELEC3610 OR ELEC5743 OR INFO2110 OR INFO5001 **Assumed knowledge:** Experience with a data model as in COMP9129 or COMP9103 or INFO9220 or INFO9120 or COMP5212 or COMP5214 or COMP5028 or COMP5138 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 on-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. Note: The lectures of this unit are co-taught with INFO2110.

COMP9120
Database Management Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 2 hour tutorial per week. **Prohibitions:** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content. **Assumed knowledge:** Some exposure to programming and some familiarity with data model concepts **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

Note that the first two thirds of the lectures of this foundational unit will be co-taught with the corresponding undergraduate class in semester 1 (INFO2120); tutorials and assignments will be organised separately.

COMP9220
Object-Oriented Design

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** : COMP5028 OR INFO3220 **Assumed knowledge:** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces essential object-oriented design methods and language mechanisms, especially the principles of modelling through Rational Unified Process and agile processes using Unified Modeling Language (UML) and Java or C++, both of which are industry standard. Students work in small groups to experience the process of object-oriented analysis, object-oriented design, implementation and testing by building a real-world application. Java or C++ is used as the implementation language and a special emphasis is placed on those features of Java or C++ that are important for solving real-world problems. Advanced software engineering features, including exceptions and name spaces are thoroughly covered.

COMP9419
Digital Media Fundamentals

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** COMP5114 **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Digital media has become indispensable our heterogeneous computing and communication environment. This unit provides an overview of creating, processing, manipulating, and compressing 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 such as web media.

INFO9003
IT for Health Professionals

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 6 hours per week; Laboratory: 6 hours per week **Prohibitions:** INFO5003 **Assessment:** Through-semester assessment (50%), Final Exam (50%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment.

Information technologies (IT) and systems have emerged as the primary platform to support communication, collaboration, research, decision making, and problem solving in contemporary health organisations. The essential necessity for students to acquire the fundamental knowledge and skills for applying IT effectively for a wide range of tasks is widely recognised. This is an introductory unit of study which prepares students in the Health 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 health 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. Students will undertake practical tasks including scripting languages and building a small scale application for managing information. In addition, the course will address the issues arising from the wide-spread use of information technology in a variety of Health area.

INFO9117
Intro to Software Engineering Practice

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hour per week; Tutorial 2 hours per week. **Assumed knowledge:** Skill as an individual programmer (as expected from any IT graduate, who could be admitted to GCertIT, GDipIT or MIT degree) **Assessment:** Through semester assessment (50%), Final Exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is an elective for students in the postgraduate IT degrees. It is expected to be taken early in the degree if (and only if) their undergraduate education and subsequent experience have not covered this vital aspect, namely working in groups under a defined process to deliver a software development project. Remark: the USyd undergraduate degrees in IT and in SE all cover this material, especially through the unit COMP3615 or INFO3600 and INFO3402; however, not all institutions guarantee this sort of experience for IT graduates. This unit will scaffold such students to do well in future group development projects, in their coursework or in industry, by providing fundamental knowledge of Software Engineering processes and practices. Much of the student's effort will be directed towards a carefully managed small-group project to deliver a software system to meet a client's needs; they will be working with a client who may be external, or who may be a member of the teaching staff role-playing as an external client. A member of the teaching staff (separate from anyone who is acting as client) will take the role of manager for the group, checking progress and providing feedback frequently. By the end of the unit, the students will understand the processes and practices used in group projects that develop software, and they will be able to follow these processes and practices, so that they can contribute effectively in a small group that is developing software to meet clients needs.

PUBH5018
Introductory Biostatistics

Credit points: 6 **Teacher/Coordinator:** Dr Kevin McGeechan and Dr Patrick Kelly **Session:** Semester 1 **Classes:** 2 x 2hr lecture, 10 x 1hr lectures, 11 x 2hr tutorials, 2 x 1hr and 8 x 0.5hr statistical computing self directed learning tasks over 12 weeks - lectures and tutorials may be completed online **Assessment:** 1x4 page assignment (30%) and 1x2.5hr open-book exam (70%). For distance students it may be possible to complete the exam externally with the approval of the course coordinator. **Mode of delivery:** Normal (lecture/lab/tutorial) evening

This unit aims to provide students with an introduction to statistical concepts, their use and relevance in public health. This unit covers descriptive analyses to summarise and display data; concepts underlying statistical inference; basic statistical methods for the analysis of continuous and binary data; and statistical aspects of study design. Specific topics include: sampling; probability distributions; sampling distribution of the mean; confidence interval and significance tests for one-sample, two paired samples and two independent samples for continuous data and also binary data; correlation and simple linear regression; distribution-free methods for two paired samples, two independent samples and correlation; power and sample size estimation for simple studies; statistical aspects of study design and analysis. Students will be required to perform analyses using a calculator and will also be required to conduct analyses using statistical software (SPSS). It is expected that students spend an additional 2 hours per week preparing for their tutorials. Computing tasks are self-directed.

Textbooks
Course notes are provided.

STAT5002
Introduction to Statistics

Credit points: 6 **Teacher/Coordinator:** A/Prof Shelton Peiris **Session:** Semester 1 **Classes:** Two lectures and one tutorial per week. **Assumed knowledge:** HSC Mathematics **Assessment:** 2 hour examination (60%), assignments (20%), quizzes (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

The aim of the unit is to introduce students to basic statistical concepts and methods for further studies. Particular attention will be paid to the development of methodologies related to statistical data analysis and Data Mining. A number of useful statistical models will be discussed and computer oriented estimation procedures will be developed. Smoothing and nonparametric concepts for the analysis of large data sets will also be discussed. Students will be exposed to the R computing language to handle all relevant computational aspects in the course.

Textbooks
All of Statistics, Larry Wasserman, Springer (2004)

Elective Units

Candidates may complete a maximum of 12 credit points from the listed Elective units.

COMP5705
Information Technology Short Project

Credit points: 6 **Session:** Semester 1, Semester 2, Summer Late, Winter Main **Classes:** Meeting 1 hr/week; Project Work - own time, **Prohibitions:** COMP5704, COMP5703, COMP5702 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Specialist/Elective/Project

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's 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 **Prohibitions:** COMP5702, COMP5703, COMP5704 **Mode of delivery:** Supervision

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 gets split over both semester 1 and semester 2.

INFS6012
Enterprise Systems Management

Credit points: 6 **Teacher/Coordinator:** Jenny Leonard **Session:** Semester 1 **Classes:** 1x 3hr seminar per week **Assessment:** mid-semester test (35%), individual enterprise system portfolio (35%), and group report (30%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a defined elective unit of study in both the Master of Professional Accounting and the Master of Commerce programs.

This unit explores the strategic managerial issues that arise from the implementation and use of Enterprise Systems as a means of integrating data and standardising processes. The unit utilises a combination of practical sessions with an Enterprise System, such as SAP, and analyses based on readings of case studies to explore the long-term effects of strategic implementation decisions, and issues with regard to Enterprise System implementation projects. The unit explores the emergence and implications of cloud-based Enterprise Systems, and the part that Enterprise Systems play in an organisation's broader information infrastructure.

INFS6015
Business Process Management

Credit points: 6 **Teacher/Coordinator:** Olivera Marjanovic **Session:** Semester 2 **Classes:** 1x 3hr seminar per week **Assessment:** individual assignment (35%), group assignment (25%), and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit provides an overview of the business process architecture and life cycle from a management perspective. It provides a detailed understanding of the concepts, strategies, tools and technologies required for modelling, analysis, design, improvement, integration, performance measurement and governance of business processes (both intra- and inter-enterprise) in any organisational and/or value chain context and relevant industry standards. The unit also develops practical skills in modelling, redesigning and improving business processes using various business process management software tools/suites.

INFS6016
Technology Enabled Business Innovation

Credit points: 6 **Teacher/Coordinator:** TBA **Session:** Semester 2 **Classes:** 1 x 3hr seminar per week **Assumed knowledge:** Understanding the major functions of a business and how those business functions interact internally and externally so the company can be competitive in the market is essential in order to critically analyse how and where a business can be innovative. Some knowledge of how technology can be applied in a business is also essential. Experience as a member of a project team is desirable. **Assessment:** individual research assignment (15%), individual problem-based assignment (35%), and group problem-based assignment (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit develops knowledge and skills in innovative, technology-enabled business models and strategies from a management perspective. The unit facilitates a better understanding and application of the concepts, strategies, tools and technologies necessary for undertaking business innovation. From basic knowledge of business models and essential business processes, this unit increases awareness and understanding of stakeholders, their capabilities and their limitations in the strategic convergence of technology and business. It provides insights into the technology and infrastructure required to support commerce in the 21st Century and supports development of student capabilities to analyse, develop and evaluate innovative technology-enabled business strategies and models.

INFS6018
Managing Business Intelligence

Credit points: 6 **Teacher/Coordinator:** Olivera Marjanovic **Session:** Semester 1 **Classes:** 1 x 3hr seminar per week **Assessment:** tutorial work (10%), mid-session exam (30%), practical assignment (20%), and final exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Business Intelligence (BI), increasingly known as Business Analytics, is a major source of competitive advantage in the Information Age and is therefore a leading business priority globally. In recent times, this field has evolved from a technology topic to a management priority, creating an unprecedented demand for new management skills. Taking a business rather than technology perspective, this unit covers all aspects of the enterprise BI ecosystem in the context of strategic and operational BI, including all five stages of BI evolution. Topics include assessment and management of organisational data quality, multidimensional data modelling and integration, management of structured and unstructured data (including those created by social media), business aspects of data warehousing, innovation through advanced analytics, BI driven performance management, business process intelligence, active enterprise intelligence, and management of complex BI projects. Access is provided to the largest world-wide community of BI academics and industry practitioners called TUN (www.TeradataUniversityNetwork.com). The hands-on experience in using a commercial BI platform, combined with in-depth analytical skills, will enable students completing the unit to help any organization (regardless of its size and industry domain) to derive more intelligence from its data and compete on analytics. This unit does not require programming experience; it is suitable for both current and aspiring BI practitioners as well as general business practitioners from any functional area interested to learn how to start and lead BI-related initiatives.

Professional Pathway units

The minimum requirement for the Professional Pathway is 12 credit points of Information Technology Capstone Project units. Candidates can complete either COMP5770 and COMP5708 (6 & 6 credit points over two semesters) or COMP5703 (12 credit points in one semester).

COMP5703
Information Technology Project

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 18 hours; Meeting 1 hour. **Prerequisites:** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. **Prohibitions:** : COMP5702 OR COMP5704 OR COMP5707 OR COMP5708 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

COMP5707
Information Technology Capstone A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research/Project Work 9 hrs per week; Meeting 1 hr per week. **Prohibitions:** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report. It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

COMP5708
Information Technology Capstone B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research/Project Work 9 hours per week; Meeting 1 hour per week. **Corequisites:** Corequisite: COMP5707 **Prohibitions:** COMP5702 OR COMP5704 OR COMP5703. Eligible students of the IT Capstone Project may choose either COMP5703 or COMP5707/COMP5708. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Capstone project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to choose a research/development project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report. It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent investigative research or design work in a setting and manner that fosters the development of IT skills in research or design.

Research Pathway units

Candidates in the Research Pathway must take all 24 credit points of the Research Pathway units of study in the table below.

COMP5702
IT Research Project A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Research 22 hrs/week; Meeting 2 hrs/week. **Prohibitions:** : COMP5707 OR COMP5708 OR COMP5703. **Assumed knowledge:** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Research Project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to define an original research project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent research work in a setting and manner that fosters the development of IT skills in research.

COMP5704
IT Research Project B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Research 22 hours; Meeting 2 h ours. **Prerequisites:** A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study with at least Distinction average marks may take this unit. **Prohibitions:** : COMP5707 OR COMP5708 OR COMP5703. Students enrolling (and eligible) for the IT Research Project are not eligible to enrol in the IT Capstone Project Units. **Assumed knowledge:** Students should take INFO5993 - Research Methods in IT either concurrently or prior to undertaking this project unit. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: A candidate for the MIT, MITM or MIT / MITM who has completed 24 credit points from Core, Specialist or Foundation units of study may take this unit. Eligible students for the IT Capstone project will be required to complete both COMP5707 (6 CPS) & COMP5708 (6 CPS), totaling 12 CPS.

The Information Technology Research Project provides an opportunity for students to carry out a defined piece of independent research or design. These skills include the capacity to define a research or design question, show how it relates to existing knowledge and carry out the research or design in a systematic manner. Students will be expected to define an original research project that demonstrates their prior learning in their advanced IT specialist domain (MIT) or the management of IT (MITM) or both technical and IT management domains (MIT/MITM). The results will be presented in a final project presentation and report.

It is not expected that the project outcomes from this unit will represent a significant contribution to new knowledge. The unit aims to provide students with the opportunity to carry out a defined piece of independent research work in a setting and manner that fosters the development of IT skills in research.

INFO5993
IT Research Methods

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 2 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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.

Majors for the Master of Information Technology/Master of Information Technology Management

The completion of a major is an optional requirement of this degree. The award of a major requires the completion of 18 credit points of Information Technology Specialist units listed under the relevant major.

Biomedical and Health Informatics

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5424
Information Technology in Biomedicine

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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, communication and security. Specialist areas such as Picture Archiving and Communication Systems (PACS), computer-aided diagnosis (CAD), 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.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

COMP5456
Introduction to Bioinformatics

This unit of study is not available in 2015

Credit points: 6 **Session:** Summer Main **Classes:** Laboratory 2 hrs/week; Lecture 2 hrs/week. **Prohibitions:** COMP3456 **Assumed knowledge:** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit brings together a wide range of skills 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. The unit covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research. It further 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.

INFO5306
Enterprise Healthcare Info Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 1 hr/week. **Assumed knowledge:** The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS). **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Healthcare systems intimately coupled to ICT have been at the forefront of many of the medical advances in modern society in the past decade. As is already the case in many other service-driven sectors, it is widely recognised that a key approach to solve some of the healthcare challenges is to harness and further ICT innovations. This unit is designed to help fill a massive technology talent gap where one of the biggest IT challenges in history is in the technology transformation of healthcare.

The unit will consist of weekly lectures, a set of group discussions (tutorials) and practical lab sessions. The contents will offer students the opportunity to develop IT knowledge and skills related to all aspects of Enterprise Healthcare Information Systems. Key Topics covered include:

* Health Information System e.g., Picture Archiving and Communication Systems (PACS) and Radiology IS
* Electronic Health Records / Personal Health Records
* Health data management
* Healthcare Transactions
* Health Statistics and Research
* Decision Support Systems including Image-based systems
* Cost Assessments and Ethics / Privacy
* TeleHealth / eHealth
* Cases studies with Australian Hospitals

Guest lecturers from the healthcare industry will be invited. The core of student's assessments will be based on individual research reports (topics related to the current industry IT needs), software / practical assignment and quizzes.

PUBH5010
Epidemiology Methods and Uses

Credit points: 6 **Teacher/Coordinator:** Professor Tim Driscoll **Session:** Semester 1 **Classes:** 1x 1hr lecture and 1x 2hr tutorial per week for 13 weeks - lectures and tutorials may be completed online **Prohibitions:** BSTA5011 **Assessment:** 1x 4page assignment (30%) and 1x 2.5hr supervised open-book exam (70%). For distance students, it may be possible to complete the exam externally with the approval of the course coordinator. **Mode of delivery:** Online

This unit provides students with core skills in epidemiology, particularly the ability to critically appraise public health and clinical epidemiological research literature. This unit covers: study types; measures of frequency and association; measurement bias; confounding/effect modification; randomized trials; systematic reviews; screening and test evaluation; infectious disease outbreaks; measuring public health impact and use and interpretation of population health data. It is expected that students spend an additional 2-3 hours at least preparing for their tutorials.

Textbooks

Webb, PW. Bain, CJ. and Pirozzo, SL. Essential Epidemiology: An Introduction for Students and Health Professionals Second Edition: Cambridge University Press 2011.

Data Management and Analytics

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5048
Visual Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Visual Analytics aims to facilitate the data analytics process through Information Visualisation. Information Visualisation aims 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 challenge for Visual Analytics is to design and implement "effective Visualisation methods that produce pictorial representation of complex data so that data analysts from various fields (bioinformatics, social network, software visualisation and network) can visually inspect complex data and carry out critical decision making.

This unit will provide basic HCI concepts, Visualisaiton 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 Visual Analytic methods.

COMP5318
Knowledge Discovery and Data Mining

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** INFO9120 OR COMP5138 **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 for data, by automatic and 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

COMP5338
Advanced Data Models

Credit points: 6 **Session:** Semester 2 **Classes:** Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1). **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 data storage technology.

Particular emphasis is put on spatial, temporal, and NoSQL data storage. This unit extensively covers the advanced features of SQL:2003, as well as a few dominant NoSQL storage technologies. Besides in lectures, the advanced topics will be also studied with prescribed readings of database research publications.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5425
Multimedia Retrieval

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 retrieval techniques demanded by users to meet their information needs. This unit provides students with the most updated knowledge in order to address this issue in the context of big data, from the basics of textual information retrieval, to many advanced techniques in the field, such as large scale retrieval and social media.

INFO5060
Data Analytics and Business Intelligence

Credit points: 6 **Session:** Summer Early **Classes:** Lecture 4 hrs; Tutorial 2 hrs; Laboratory 6 hrs; Presentation 3 hrs; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Block mode

The frontier for using data to make decisions has shifted dramatically. High performing enterprises are now building their competitive strategies around data-driven insights that in turn generate impressive business results. This course provides an overview of Business Intelligence (BI) concepts, technologies and practices, and then focuses on the application of BI through a team based project simulation that will allow students to have practical experience in building a BI solution based on a real world case study.

ISYS5050
Knowledge Management Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The need to track and facilitate the sharing of the core knowledge resources in contemporary organisations is widely recognised. This course will provide a comprehensive introduction to the emerging area of Knowledge Management (KM) from both technological and organisational perspectives. We will review and discuss a range of published papers, case studies, and other publications that deal with a range of important KM-related topics. One of the key knowledge management technologies, Business Intelligence Systems, will be covered in detail. It will also include hands-on work using the BI (Online Analytical Processing - OLAP) tool, COGNOS.

Some of the main themes to be covered will include:

oKM: Conceptual Foundations

oTaxonomies of organizational knowledge and KM mechanisms

oCase/Field Studies of KM Initiatives

o Data Warehousing and OLAP/Business Analytics

oData, text, and web mining.

oSocial media,crowdsourcing, an KM

STAT5003
Computational Statistical Methods

Credit points: 6 **Teacher/Coordinator:** A/Prof Shelton Peiris **Session:** Semester 2 **Classes:** Two lectures and one tutorial per week. **Prerequisites:** STAT5002 **Assessment:** 2 hour examination (60%), assignments (20%), quizzes (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

Note: Department permission required for enrolment.

The objectives of this unit of study are to develop an understanding of modern computationally intensive methods for statistical inference, exploratory data analysis and data mining. Advanced computational methods for statistics will be introduced, including univariate, multivariate and combinatorial optimisation methods and simulation methods, such as Gibbs sampling, the Bootstrap, Monte Carlo and the Jackknife approach. In addition, the unit will demonstrate how to apply the above techniques effectively for use on large data sets in practice. Finally, this unit will show how to make inferences about populations of interest in data mining problems.

Textbooks

Computational Statistics, Geof H. Givens, Jennifer A. Hoeting, Wiley (2005)

Digital Media Technology

CISS6022
Cybersecurity

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week **Assessment:** 1x2hr exam (40%), 1x3000wd analytical Essay (40%), 1x1000wd equivalent lab exercise (10%), 1xSeminar participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The digital revolution has created new frontiers of information that influence almost every aspect of our lives. But does cyberspace also threaten our security? What are the methods and motives for attack? And how can state and non-state actors respond? Drawing on a unique combination of expertise from the Centre for International Security Studies and the School of Information Technologies, this unit introduces students to the technical and political concepts that are necessary to answer these important questions.

COMP5045
Computational Geometry

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - in class 12 hrs/week. **Assumed knowledge:** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees. **Assessment:** Through semester assessment (80%) Final Exam (20%) **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 geometric 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.

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

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Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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
Visual Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Visual Analytics aims to facilitate the data analytics process through Information Visualisation. Information Visualisation aims 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.

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This unit will provide basic HCI concepts, Visualisaiton 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 Visual Analytic methods.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5347
Web Application Development

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week; Project Work - own time 3 hrs/week; Independent Study, **Assumed knowledge:** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5415
Multimedia Design and Authoring

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5114 or COMP9419. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5425
Multimedia Retrieval

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 retrieval techniques demanded by users to meet their information needs. This unit provides students with the most updated knowledge in order to address this issue in the context of big data, from the basics of textual information retrieval, to many advanced techniques in the field, such as large scale retrieval and social media.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

IDEA9106
Design Thinking

Credit points: 6 **Teacher/Coordinator:** Dr Lian Loke **Session:** Semester 1, Semester 2 **Classes:** Lecture 1hr/wk, Tutorial 2hrs/wk **Assessment:** Design assignments (90%), Participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an overview of a human (or user) centred approach to the design of interactive technologies. It introduces students to design thinking and how it can be productively applied to different design situations. The theoretical concepts, methods and tools for the key stages of interaction design are covered including user research, ideation, prototyping and user evaluation. The cognitive processes of individual designers are also explored. Students learn to persuasively communicate and pitch design concepts with an emphasis on the user experience through visual storytelling and the use of video. It provides students with the principles, processes and tools for working on user-centred design in studio projects. Students will acquire the following learning outcomes:

1. An appreciation of the role of design thinking in traditional and cross-disciplinary contexts

2. Theoretical and practical understanding and application of human-centred methodologies, methods and tools

3. Demonstration of ideation and concept development, informed by user and background research, to innovate interactive technology solutions to complex problems

4. Awareness of design processes and cognition in collaborative, inter-disciplinary teams

5. Demonstration of persuasive oral/visual communication techniques

Networks and Distributed Systems

CISS6022
Cybersecurity

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week **Assessment:** 1x2hr exam (40%), 1x3000wd analytical Essay (40%), 1x1000wd equivalent lab exercise (10%), 1xSeminar participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The digital revolution has created new frontiers of information that influence almost every aspect of our lives. But does cyberspace also threaten our security? What are the methods and motives for attack? And how can state and non-state actors respond? Drawing on a unique combination of expertise from the Centre for International Security Studies and the School of Information Technologies, this unit introduces students to the technical and political concepts that are necessary to answer these important questions.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5313
Large Scale Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The growing connectedness of modern society translates into simplifying global communication and accelerating spread of news, information and epidemics. The focus of this unit is on the key concepts to address the challenges induced by the recent scale shift of complex networks. In particular, the course will present how scalable solutions exploiting graph theory, sociology, game theory and probability tackle the problems of communicating (routing, diffusing, aggregating) in dynamic and social networks.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5416
Advanced Network Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

ELEC5509
Mobile Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

ELEC5616
Computer and Network Security

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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.

Software Engineering

CISS6022
Cybersecurity

Credit points: 6 **Session:** Semester 1 **Classes:** 1x2hr seminar/week **Assessment:** 1x2hr exam (40%), 1x3000wd analytical Essay (40%), 1x1000wd equivalent lab exercise (10%), 1xSeminar participation (10%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The digital revolution has created new frontiers of information that influence almost every aspect of our lives. But does cyberspace also threaten our security? What are the methods and motives for attack? And how can state and non-state actors respond? Drawing on a unique combination of expertise from the Centre for International Security Studies and the School of Information Technologies, this unit introduces students to the technical and political concepts that are necessary to answer these important questions.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5347
Web Application Development

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week; Project Work - own time 3 hrs/week; Independent Study, **Assumed knowledge:** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

ELEC5616
Computer and Network Security

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughoug the week and make sure that time is truly productive. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

Students who successfully complete this unit will understand the fundamental concepts of software quality engineering and be able to define software quality requirements, assess the quality of a software design, explain specific methods of building software quality, understand software reliability models and metrics, develop a software quality plan, understand quality assurance and control activities and techniques, understand various testing techniques including being able to verify and test a unit of code and comprehend ISO standards, SPICE, CMM and CMMI.

ELEC5619
Object Oriented Application Frameworks

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial 3 hrs. **Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended **Assessment:** Through semester assessment (100%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week; Laboratory - Project Work - in class 2 hrs/week; Project Work - own time 2 hrs. **Assumed knowledge:** A programming language, basic maths. **Assessment:** Through semester assessment (80%) Final Exam (20%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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.

ELEC5622
Signals, Software and Health

Credit points: 6 **Session:** Semester 2 **Classes:** Project Work - in class 3 hrs/week; Project Work - own time 6 hrs; Presentation 2 hrs; Tutorial/labs 3 hrs/week. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

This unit aims to introduce students to the main issues involved in producing systems that use sensor data, such as those from physiology and activity tracking, often combined with patients self-reports. As sensing devices become ubiquitous, data processing, storage and visualization techniques are becoming part of all health systems, both institutionalized and individually driven.

The unit is related to, but distinct, to health informatics - an area that focuses on the the use of computing to deliver cost efficient healthcare and the area of bioinformatics, that explores the role of computing in understanding biology at the cellular level (e.g. genome). This unit focuses on the technical and non-technical problems of developing increasingly ubiquitous devices and systems that can be used for personal and clinical monitoring.

Telecommunications Engineering

COMP5416
Advanced Network Technologies

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

ELEC5507
Error Control Coding

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Project Work - own time 5 hrs; Tutorial 1 hr/week. **Assumed knowledge:** Fundamental mathematics including probability theory and linear algebra. Basic knowledge on digital communications. Basic MATLAB programming skills is desired. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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. 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, Applications of block codes in communications, Convolutional codes, Viterbi algorithm, Applications of convolutional codes in communications, Soft decision decoding of block and convolutional codes, Trellis coded modulation, Turbo codes and LDPC codes.

ELEC5508
Wireless Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **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. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Site Visit 3 hrs; Project Work - own time 5 hrs; Tutorial 1 hr/week; Laboratory 3 hrs/week. **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. **Assessment:** Through semester assessment (30%) Final Exam (70%) **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:** Lecture 2 hrs/week; Tutorial 2 hrs/week. **Assumed knowledge:** ELEC3505 and ELEC3405 **Assessment:** Through semester assessment (25%) Final Exam (75%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: -

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This Unit builds upon the fundamentals of optical communication introduced in ELEC3405 (Communications Electronics and Photonics). 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.

For more information on units of study visit CUSP.

Graduate Diploma in Computing

Course overview

The Graduate Diploma in Computing will provide you with a strong foundation in information technolgies.

It will equip you with a basic knowledge of IT which can be developed with further study, or be the foundation for a new career in IT.

A credit average in the diploma will prepare you for admission to the Master of Information Technology and the Master of Information Technology Management.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Accreditation

The Graduate Diploma in Computing has been accredited by the Australian Computer Society at the Associate Level.

Graduate Diploma in Computing

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
GNCOMPUT-02	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 60 credit points including:
(a) a maximum of 24 credit points of Foundation units of study; and
(b) a minimum of 36 credit points of Information Technology or Information Technology Management Specialist units of study.
(3) If a reduction in the volume of learning is given:
(a) candidates will be required to apply any reduction in the volume of learning to the Foundation units of study only.
(b) the candidate will then be required to complete the required volume of learning based on the course requirements.

5 Recognition for prior learning

(1) The following Coursework Rules (for conferred qualifications) replace the Faculty Coursework Rules for "Credit for previous study" within the "Resolutions of the Faculty (of Engineering and Information Technologies)" for the Graduate Diploma in Computing:
(a) Candidates for the Graduate Diploma in Computing may be eligible for a reduction in the volume of learning of up to 12 credit points for an equivalent conferred volume of learning after an entry assessment is made for prior learning and/or work experience that is deemed by the School of Information Technologies to be relevant.

6 Suspension of candidature

A student may suspend candidature in this course for a maximum of one year.

7 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.

8 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.

9 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.

10 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 ten semesters.

11 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2015 and students who commenced their candidature prior to 1 January, 2015 who elect to proceed under these resolutions.
(2) Candidates who commenced prior to 1 January, 2015 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Graduate Diploma in Computing			
Candidates for the Graduate Diploma in Computing are required to complete 60 credit points of the units of study from the table below, as follows:			
1. a maximum of 24 credit points of the Foundation units of study			
2. a minimum of 36 credit points of the Information Technology or Information Technology Management Specialist units of study.			
Foundation Units			
Candidates for the Graduate Diploma in Computing complete a maximum of four Foundation units of study (24 credit points) out of the units listed. Candidates need to complete relevant Foundation units or provide evidence of prior learning before undertaking any Specialist unit(s). This will be assessed by either completion of prerequisite learning in the Foundation units or evidence from prior learning that fulfils the assumed knowledge criteria for the Specialist unit(s) chosen.			
COMP5116 **Design of Networks & Distributed Systems**	6		Semester 2
COMP5213 **Computer and Network Organisation**	6		Semester 1
COMP9007 **Algorithms**	6	**A** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **N** COMP5211	Semester 2
COMP9103 **Software Development in Java**	6	**N** COMP5214	Semester 1 Semester 2
COMP9110 **System Analysis and Modelling**	6	**A** Experience with a data model as in COMP9129 or COMP9103 or INFO9220 or INFO9120 or COMP5212 or COMP5214 or COMP5028 or COMP5138 **N** : ELEC3610 OR ELEC5743 OR INFO2110 OR INFO5001	Semester 2
COMP9120 **Database Management Systems**	6	**A** Some exposure to programming and some familiarity with data model concepts **N** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content.	Semester 1 Semester 2
COMP9220 **Object-Oriented Design**	6	**A** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **N** : COMP5028 OR INFO3220	Semester 1
COMP9419 **Digital Media Fundamentals**	6	**N** COMP5114	Semester 1
INFO9117 **Intro to Software Engineering Practice**	6	**A** Skill as an individual programmer (as expected from any IT graduate, who could be admitted to GCertIT, GDipIT or MIT degree)	Semester 1 Semester 2
Information Technology Specialist Units			
36 credit points are to be completed from the Specialist units of study in Information Technology or Information Technology Management. Candidates need to complete relevant Foundation units or provide evidence of prior learning before undertaking any Specialist unit(s). This will be assessed by either completion of prerequisite learning in the Foundation units or evidence from prior learning that fulfils the assumed knowledge criteria for the Specialist unit(s) chosen.			
COMP5045 **Computational Geometry**	6	**A** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees.	Semester 1
COMP5046 **Statistical Natural Language Processing**	6	**A** Knowledge of an OO programming language *Practical work will use the Natural Language Toolkit*	Semester 1
COMP5047 **Pervasive Computing**	6	**A** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. *Note: Department permission required for enrolment*	Semester 2
COMP5048 **Visual Analytics**	6	**A** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills.	Semester 2
COMP5216 **Mobile Computing**	6	**A** COMP5214 Software Development in JAVA, or similar introductory software development units.	Semester 2
COMP5313 **Large Scale Networks**	6	**A** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. *Note: Department permission required for enrolment*	Semester 1
COMP5318 **Knowledge Discovery and Data Mining**	6	**A** INFO9120 OR COMP5138	Semester 1
COMP5338 **Advanced Data Models**	6	**A** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1).	Semester 2
COMP5347 **Web Application Development**	6	**A** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams.	Semester 1

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5348 **Enterprise Scale Software Architecture**	6	**A** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.	Semester 1
COMP5349 **Cloud Computing**	6	**A** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA	Semester 1
COMP5415 **Multimedia Design and Authoring**	6	**A** COMP5114 or COMP9419.	Semester 2
COMP5416 **Advanced Network Technologies**	6	**A** COMP5116 OR ELEC3506	Semester 2
COMP5424 **Information Technology in Biomedicine**	6		Semester 1
COMP5425 **Multimedia Retrieval**	6	**A** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge.	Semester 1
COMP5426 **Parallel and Distributed Computing**	6	**A** COMP5116	Semester 1
COMP5427 **Usability Engineering**	6		Semester 2
COMP5456 **Introduction to Bioinformatics** *This unit of study is not available in 2015*	6	**A** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **N** COMP3456	Summer Main
INFO5060 **Data Analytics and Business Intelligence**	6	**A** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems	Summer Early

Information Technology Management Specialist Units

36 credit points are to be completed from the Specialist units of study in Information Technology or Information Technology Management. Candidates need to complete relevant Foundation units or provide evidence of prior learning before undertaking any Specialist unit(s). This will be assessed by either completion of prerequisite learning in the Foundation units or evidence from prior learning that fulfils the assumed knowledge criteria for the Specialist unit(s) chosen.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
COMP5206 **Information Technologies and Systems**	6		Semester 1 Semester 2
INFO5301 **Information Security Management**	6	**A** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable.	Semester 1
INFO5991 **Services Science Management and Eng**	6	**A** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business. *Note: Department permission required for enrolment*	Semester 1 Semester 2
INFO5992 **Understanding IT Innovations**	6	**A** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **N** PMGT5875 *A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.*	Semester 1 Semester 2
INFO6007 **Project Management in IT**	6	**A** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **N** PMGT5871	Semester 1 Semester 2
INFO6010 **Advanced Topics in IT Project Management**	6	**A** Students are assumed to understand the role of IT projects. **P** INFO6007, OR 3-5 years working experience in IT Project Management	Semester 2
INFO6012 **Information Technology Strategy & Value**	6	**A** COMP5206. Introduction to Information Systems	Semester 2
ISYS5050 **Knowledge Management Systems**	6	**A** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.	Semester 1
ISYS5070 **Change Management in IT**	6	**A** The unit is expected to be taken after the following related units INFO6007 Project Managemnet in IT and COMP5206 Introduction to Information Systems.	Winter Main

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Graduate Diploma in Computing

Candidates for the Graduate Diploma in Computing are required to complete 60 credit points of the units of study from the table below, as follows:1. a maximum of 24 credit points of the Foundation units of study2. a minimum of 36 credit points of the Information Technology or Information Technology Management Specialist units of study.

Foundation Units

Candidates for the Graduate Diploma in Computing complete a maximum of four Foundation units of study (24 credit points) out of the units listed. Candidates need to complete relevant Foundation units or provide evidence of prior learning before undertaking any Specialist unit(s). This will be assessed by either completion of prerequisite learning in the Foundation units or evidence from prior learning that fulfils the assumed knowledge criteria for the Specialist unit(s) chosen.

COMP5116
Design of Networks & Distributed Systems

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The unit covers general foundations of communication systems and a detailed walk through of the implementation of the TCP/IP protocol stack, which forms the basis of the Internet. The unit also covers the basic knowledge of how to analyse, design and implement simple communication protocols.

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 and design.

COMP5213
Computer and Network Organisation

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study provides an introduction to computer organisation and network protocols. It covers a broad range of topics including computer hardware, software architecture (operating systems, compilers, etc), and principles of communication network protocols. It is designed to give students an understanding of how software programs operate and run inside the computer hardware, and therefore the knowledge how to use computers most effectively.

COMP9007
Algorithms

Credit points: 6 **Session:** Semester 2 **Classes:** One 2 hour lectures and one 1 hour tutorial per week. **Prohibitions:** COMP5211 **Assumed knowledge:** This unit of study assumes that students have general knowledge of mathematics (especially Discrete Math) and problem solving. Having moderate knowledge about Data structure can also help students to better understand the concepts of Algorithms will be taught in this course. **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 computational thinking from simple list manipulation and data format conversion, up to shortest paths and cycle detection in graphs. Students will gain essential knowledge in computer science, including basic concepts in data structures, algorithms, and intractability, using paradigms such as dynamic programming, divide and conquer, greed, local search, and randomisation, as well NP-hardness.

COMP9103
Software Development in Java

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture: 2 hours per week; Laboratory: 1 hours per week **Prohibitions:** COMP5214 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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. Students will be progressively guided in 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.

COMP9110
System Analysis and Modelling

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture: 2 hours per week; Tutorial: 1 hours per week **Prohibitions:** : ELEC3610 OR ELEC5743 OR INFO2110 OR INFO5001 **Assumed knowledge:** Experience with a data model as in COMP9129 or COMP9103 or INFO9220 or INFO9120 or COMP5212 or COMP5214 or COMP5028 or COMP5138 **Assessment:** Through semester assessment (40%), Final Exam (60%) **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 on-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. Note: The lectures of this unit are co-taught with INFO2110.

COMP9120
Database Management Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** One 2 hour lecture and one 2 hour tutorial per week. **Prohibitions:** INFO2120 OR INFO2820 OR INFO2005 OR INFO2905 OR COMP5138. Students who have previously studied an introductory database subject as part of their undergraduate degree should not enrol in this foundational unit, as it covers the same foundational content. **Assumed knowledge:** Some exposure to programming and some familiarity with data model concepts **Assessment:** Through semester assessment (40%), Final Exam (60%) **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.

Note that the first two thirds of the lectures of this foundational unit will be co-taught with the corresponding undergraduate class in semester 1 (INFO2120); tutorials and assignments will be organised separately.

COMP9220
Object-Oriented Design

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** : COMP5028 OR INFO3220 **Assumed knowledge:** Students enrolled in COMP5028/INFO9220 are assumed to have elementary Java programming experience or equivalent experience in another object oriented programming language. This unit does not have assessment with heavy coding task. But some knowledge in object-oriented programming would have big impact on learning experience. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit introduces essential object-oriented design methods and language mechanisms, especially the principles of modelling through Rational Unified Process and agile processes using Unified Modeling Language (UML) and Java or C++, both of which are industry standard. Students work in small groups to experience the process of object-oriented analysis, object-oriented design, implementation and testing by building a real-world application. Java or C++ is used as the implementation language and a special emphasis is placed on those features of Java or C++ that are important for solving real-world problems. Advanced software engineering features, including exceptions and name spaces are thoroughly covered.

COMP9419
Digital Media Fundamentals

Credit points: 6 **Session:** Semester 1 **Classes:** One 2 hour lecture and one 1 hour tutorial per week. **Prohibitions:** COMP5114 **Assessment:** Through semester assessment (50%), Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Digital media has become indispensable our heterogeneous computing and communication environment. This unit provides an overview of creating, processing, manipulating, and compressing 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 such as web media.

INFO9117
Intro to Software Engineering Practice

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hour per week; Tutorial 2 hours per week. **Assumed knowledge:** Skill as an individual programmer (as expected from any IT graduate, who could be admitted to GCertIT, GDipIT or MIT degree) **Assessment:** Through semester assessment (50%), Final Exam (50%). **Mode of delivery:** Normal (lecture/lab/tutorial) day

This is an elective for students in the postgraduate IT degrees. It is expected to be taken early in the degree if (and only if) their undergraduate education and subsequent experience have not covered this vital aspect, namely working in groups under a defined process to deliver a software development project. Remark: the USyd undergraduate degrees in IT and in SE all cover this material, especially through the unit COMP3615 or INFO3600 and INFO3402; however, not all institutions guarantee this sort of experience for IT graduates. This unit will scaffold such students to do well in future group development projects, in their coursework or in industry, by providing fundamental knowledge of Software Engineering processes and practices. Much of the student's effort will be directed towards a carefully managed small-group project to deliver a software system to meet a client's needs; they will be working with a client who may be external, or who may be a member of the teaching staff role-playing as an external client. A member of the teaching staff (separate from anyone who is acting as client) will take the role of manager for the group, checking progress and providing feedback frequently. By the end of the unit, the students will understand the processes and practices used in group projects that develop software, and they will be able to follow these processes and practices, so that they can contribute effectively in a small group that is developing software to meet clients needs.

Information Technology Specialist Units

36 credit points are to be completed from the Specialist units of study in Information Technology or Information Technology Management. Candidates need to complete relevant Foundation units or provide evidence of prior learning before undertaking any Specialist unit(s). This will be assessed by either completion of prerequisite learning in the Foundation units or evidence from prior learning that fulfils the assumed knowledge criteria for the Specialist unit(s) chosen.

COMP5045
Computational Geometry

Credit points: 6 **Session:** Semester 1 **Classes:** Project Work - in class 12 hrs/week. **Assumed knowledge:** Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-O notations and simple algorithmic techniques like sorting, binary search, and balanced search trees. **Assessment:** Through semester assessment (80%) Final Exam (20%) **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 geometric 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.

COMP5046
Statistical Natural Language Processing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Knowledge of an OO programming language **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Practical work will use the Natural Language Toolkit

This unit introduces computational linguistics and the statistical techniques and algorithms used to automatically process natural languages (such as English or Chinese). It will review the core statistics and information theory, and the basic linguistics, required to understand statistical natural language processing (NLP).

Statistical NLP is used in a wide range of applications, including information retrieval and extraction; question answer; machine translation; and classifying and clustering of documents. This unit will explore state of the art approaches to the key NLP sub-tasks, including tokenisation, morphological analysis, word sense disambiguation, part-of-speech tagging, named entity recognition, text categorisation, phrase structure and Combinatory Categorial Grammar parsing.

Students will implement many of these sub-tasks in labs and assignments. The unit will also investigate the annotation process that is central to creating training data for statistical NLP systems. Students will annotate data as part of completing a real-world NLP task.

COMP5047
Pervasive Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Studio class 3 hrs/week. **Assumed knowledge:** Background in programming and operating systems that is sufficient for the student to independently learn new programming tools from standard online technical materials. Ability to conduct a literature search. Ability to write reports of work done. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

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
Visual Analytics

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Visual Analytics aims to facilitate the data analytics process through Information Visualisation. Information Visualisation aims 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 challenge for Visual Analytics is to design and implement "effective Visualisation methods that produce pictorial representation of complex data so that data analysts from various fields (bioinformatics, social network, software visualisation and network) can visually inspect complex data and carry out critical decision making.

This unit will provide basic HCI concepts, Visualisaiton 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 Visual Analytic methods.

COMP5216
Mobile Computing

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units. **Assessment:** Through semester assessment (45%) Final Exam (55%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Mobile computing is becoming a main stream for many IT applications, due to the availability of more and more powerful and affordable mobile devices with rich sensors such as cameras and GPS, which have already significantly changed many aspects in business, education, social network, health care, and entertainment in our daily life. Therefore it has been critical for students to be equipped with sufficient knowledge of such new computing platform and necessary skills. The unit aims to provide an in-depth overview of existing and emerging mobile computing techniques and applications, the eco-system of the mobile computing platforms, and its key building components. The unit will also train students with hand-on experiences in developing mobile applications in a broad range of areas.

COMP5313
Large Scale Networks

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** Algorithmic skills (as expected from any IT graduate). Basic probability knowledge. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The growing connectedness of modern society translates into simplifying global communication and accelerating spread of news, information and epidemics. The focus of this unit is on the key concepts to address the challenges induced by the recent scale shift of complex networks. In particular, the course will present how scalable solutions exploiting graph theory, sociology, game theory and probability tackle the problems of communicating (routing, diffusing, aggregating) in dynamic and social networks.

COMP5318
Knowledge Discovery and Data Mining

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** INFO9120 OR COMP5138 **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

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 for data, by automatic and 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

COMP5338
Advanced Data Models

Credit points: 6 **Session:** Semester 2 **Classes:** Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138/ INFO9120 (Database Management Systems) or INFO2120/2820 (Database Systems 1). **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 data storage technology.

Particular emphasis is put on spatial, temporal, and NoSQL data storage. This unit extensively covers the advanced features of SQL:2003, as well as a few dominant NoSQL storage technologies. Besides in lectures, the advanced topics will be also studied with prescribed readings of database research publications.

COMP5347
Web Application Development

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Laboratory 1 hr/week; Project Work - own time 3 hrs/week; Independent Study, **Assumed knowledge:** INFO9220 or COMP5028. The course assumes basic knowledge on OO design and UML diagrams. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** Programming competence in Java or similar OO language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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.

COMP5349
Cloud Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Practical Labs 2 hrs/week; Project Work 3 hrs/week. **Assumed knowledge:** Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. The unit is expected to be taken after introductory courses in related units such as COMP5214 OR INFO9103 Software Development in JAVA **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit covers topics of active and cutting-edge research within IT in the area of 'Cloud Computing'.

Cloud Computing is an emerging paradigm of utilising large-scale computing services over the Internet that will affect individual and organization's computing needs from small to large. Over the last decade, many cloud computing platforms have been set up by companies like Google, Yahoo!, Amazon, Microsoft, Salesforce, Ebay and Facebook. Some of the platforms are open to public via various pricing models. They operate at different levels and enable business to harness different computing power from the cloud.

In this course, we will describe the important enabling technologies of cloud computing, explore the state-of-the art platforms and the existing services, and examine the challenges and opportunities of adopting cloud computing. The course will be organized as a series of presentations and discussions of seminal and timely research papers and articles. Students are expected to read all papers, to lead discussions on some of the papers and to complete a hands-on cloud-programming project.

COMP5415
Multimedia Design and Authoring

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5114 or COMP9419. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Laboratory 1 hr/week. **Assumed knowledge:** COMP5116 OR ELEC3506 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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, communication and security. Specialist areas such as Picture Archiving and Communication Systems (PACS), computer-aided diagnosis (CAD), 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 Retrieval

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP9007 or COMP5211. Basic Programming skills and data structure knowledge. **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 retrieval techniques demanded by users to meet their information needs. This unit provides students with the most updated knowledge in order to address this issue in the context of big data, from the basics of textual information retrieval, to many advanced techniques in the field, such as large scale retrieval and social media.

COMP5426
Parallel and Distributed Computing

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** COMP5116 **Assessment:** Through semester assessment (40%) Final Exam (60%) **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 pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. 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.

COMP5427
Usability Engineering

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Laboratory 2 hrs/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Usability engineering is the systematic process of designing and evaluating user interfaces so that they are usable. This means that people can readily learn to use them efficiently, can later remember how to use them and find it pleasant to use them. The wide use of computers in many aspects of people's lives means that usability engineering is of the utmost importance.

There is a substantial body of knowledge about how to elicit usability requirements, identify the tasks that a system needs to support, design interfaces and then evaluate them. This makes for systematic ways to go about the creation and evaluation of interfaces to be usable for the target users, where this may include people with special needs. The field is extremely dynamic with the fast emergence of new ways to interact, ranging from conventional WIMP interfaces, to touch and gesture interaction, and involving mobile, portable, embedded and desktop computers.

This unit will enable students to learn the fundamental concepts, methods and techniques of usability engineering. Students will practice these in small classroom activities. They will then draw them together to complete a major usability evaluation assignment in which they will design the usability testing process, recruit participants, conduct the evaluation study, analyse these and report the results.

COMP5456
Introduction to Bioinformatics

This unit of study is not available in 2015

Credit points: 6 **Session:** Summer Main **Classes:** Laboratory 2 hrs/week; Lecture 2 hrs/week. **Prohibitions:** COMP3456 **Assumed knowledge:** Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evinced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. **Assessment:** Through semester assessment (30%) Final Exam (70%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit brings together a wide range of skills 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. The unit covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research. It further 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.

INFO5060
Data Analytics and Business Intelligence

Credit points: 6 **Session:** Summer Early **Classes:** Lecture 4 hrs; Tutorial 2 hrs; Laboratory 6 hrs; Presentation 3 hrs; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after introductory courses or related units such as COMP5206 Information Technologies and Systems **Assessment:** Through semester assessment (65%) Final Exam (35%) **Mode of delivery:** Block mode

The frontier for using data to make decisions has shifted dramatically. High performing enterprises are now building their competitive strategies around data-driven insights that in turn generate impressive business results. This course provides an overview of Business Intelligence (BI) concepts, technologies and practices, and then focuses on the application of BI through a team based project simulation that will allow students to have practical experience in building a BI solution based on a real world case study.

Information Technology Management Specialist Units

36 credit points are to be completed from the Specialist units of study in Information Technology or Information Technology Management. Candidates need to complete relevant Foundation units or provide evidence of prior learning before undertaking any Specialist unit(s). This will be assessed by either completion of prerequisite learning in the Foundation units or evidence from prior learning that fulfils the assumed knowledge criteria for the Specialist unit(s) chosen.

COMP5206
Information Technologies and Systems

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will provide a comprehensive introduction to the field of information systems from organisational and managerial perspectives. The emergence of the digital firm and its implications will be studied. The critical role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Key topics covered will include:

*Basic Information Systems Concepts

*Systems Approach and Systems Thinking

*E-Business and E-Commerce

*IT Strategy and Competitive Advantage

*Data and Knowledge Management

*Information Systems Development and IS Management

*Decision support systems, business intelligence and online analytical processing systems (OLAP)

*Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems, Enterprise Content Management and Supply Chain Management (SCM) systems

*Ethical, Legal and Social Aspects of Information technologis.

INFO5301
Information Security Management

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** This unit of study assumes foundational knowledge of Information systems management. Two year IT industry exposure and a breadth of IT experience will be preferable. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study gives a broad view of the management aspects of information security. We emphasise corporate governance for information security, organisational structures within which information security is managed, risk assessment, and control structures. Planning for security, and regulatory issues, are also addressed.

INFO5991
Services Science Management and Eng

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1 hr/week; Seminar 2 hrs/week. **Assumed knowledge:** INFO5990. Students are expected to have a degree in computer science, engineering, information technology, information systems or business. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: Department permission required for enrolment.

The service economy plays a dominant and growing role in growth and employment in most parts of the world. Increasingly, the improved productivity and competitive performance of firms and nations in the services arena relies on innovative and effective design, engineering and management of IT-centric services. In response to industry needs, this unit offers IT professionals a social, economic and technical perspective of service-oriented IT.

INFO5992
Understanding IT Innovations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Prohibitions:** PMGT5875 **Assumed knowledge:** INFO5990. Students are expected to be fluent in English and capable of participating in group discussions, and capable of producing an individually written paper of 5-9 pages (double spaced) of high quality and clarity. Although some work experience is ideal in adding value to the case discussions, allowing students to pull from their personal experiences, those students with no work experience will be expected to do appropriate research on the discussion topics in order to contribute. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: A variety of learning situations will be employed during the unit of study, including lectures, recommended reading, a few short exercises during class, and discussions of cases. To benefit fully from this unit it is necessary to participate fully in all aspects of the unit of study.

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.

INFO6007
Project Management in IT

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture Workshop 3 hrs/week; WeeklyAssignments 5 hrs; Exam Preparation 16 hrs. **Prohibitions:** PMGT5871 **Assumed knowledge:** Students enrolled in INFO6007 are assumed to have previously completed a Bachelors degree in some area of IT, or have completed a Graduate Diploma in some area of IT, or have three years experience as a practising IT professional. Recent work experience, or recent postgraduate education, in software project management, software process improvement, or software quality assurance is an advantage. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit of study covers the factors necessary for successful management of a wide variety of Information Technology projects. The course covers both quantitative and qualitative aspects of project management. Topics include the management of time, scope, budget, risk, quality, and resources through each of the phases of a project.

INFO6010
Advanced Topics in IT Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial (applied workshop) 1 hr/week; E-Learning 1 hr/week. **Prerequisites:** INFO6007, OR 3-5 years working experience in IT Project Management **Assumed knowledge:** Students are assumed to understand the role of IT projects. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

This unit will explore the limitations of IT project management and the most promising techniques to overcome project failure. It will start by reviewing case study research showing we have reached the limits of traditional IT project management practice. The theoretical base will be completed by exploring the finding that senior management have more impact on success than traditional approaches.

Participants will be introduced to and learn to apply the most promising tools and techniques needed to govern IT projects. The topics reviewed will include:

1)strategy,

2)organisational change,

3)project sponsorship,

4)programme management,

5)performance measurement,

6)culture

7)portfolio management.

8)Relevant Australian and International Standards on IT/Project Governance and new industry methodologies around portfolio, programme and change management will be reviewed.

INFO6012
Information Technology Strategy & Value

Credit points: 6 **Session:** Semester 2 **Classes:** Flexible Session 3 hrs/week. **Assumed knowledge:** COMP5206. Introduction to Information Systems **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The increasingly strategic role of IT in organisations is widely recognised. This unit of study is designed to provide a comprehensive introduction to strategic aspects of IT as they impact on business value. Such a perspective is critical for IT professionals in both IT producer and user organisations from the level of Chief Information Officer to managers as well as technical specialists. Deep understanding of IT strategy formulation and implementation and ensuring its alignment with the organisation's strategic directions is important for successfully managing the major changes that the IT function has undergone in recent years.

Topics covered will include technology forecasting and assessment of IT impacts, achieving sustainable competitive through IT, relationship between IT strategy and value, IT strategy formulation and implementation, evaluation of strategic investments in IT, IT portfolio management, IT souring and open innovation, and dynamics of IT strategy and game theory. It will explore IT-related strategic decision making at the different organisational levels and the concept of strategic congruence. This unit will provide students with models, tools, and techniques to evaluate an organisation's IT strategic position, and hence to help make appropriate strategic choices.

ISYS5050
Knowledge Management Systems

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assumed knowledge:** An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The need to track and facilitate the sharing of the core knowledge resources in contemporary organisations is widely recognised. This course will provide a comprehensive introduction to the emerging area of Knowledge Management (KM) from both technological and organisational perspectives. We will review and discuss a range of published papers, case studies, and other publications that deal with a range of important KM-related topics. One of the key knowledge management technologies, Business Intelligence Systems, will be covered in detail. It will also include hands-on work using the BI (Online Analytical Processing - OLAP) tool, COGNOS.

Some of the main themes to be covered will include:

oKM: Conceptual Foundations

oTaxonomies of organizational knowledge and KM mechanisms

oCase/Field Studies of KM Initiatives

o Data Warehousing and OLAP/Business Analytics

oData, text, and web mining.

oSocial media,crowdsourcing, an KM

ISYS5070
Change Management in IT

Credit points: 6 **Session:** Winter Main **Classes:** Lecture 6 hrs/week; Tutorial 6 hrs/week; Presentation 3 hrs/week; Project Work - own time 6 hrs. **Assumed knowledge:** The unit is expected to be taken after the following related units INFO6007 Project Managemnet in IT and COMP5206 Introduction to Information Systems. **Assessment:** Through semester assessment (70%) Final Exam (30%) **Mode of delivery:** Block mode

This unit of study presents the leading edge of research and practice in change management and focuses on theories, frameworks and perspectives that can guide your work as a change agent in the IT industries. The unit will cover a range of approaches, methods, interventions and tools that can be used to successfully manage change projects that relate to the implementation of new technologies.

The globalisation of markets and industries, accelerating technological innovations and the need of companies to remain at the forefront of technological developments in an increasingly competitive, globalised industry have resulted in a significant increase in the speed, magnitude, and unpredictability of technological and organisational change over the last decades. Companies who have the competencies required to navigate change and overcome the inevitable obstacles to success gain a much-needed competitive edge in the marketplace. Increased globalization, economic rationalism, environmental dynamics and technological changes mean that companies, more than ever before, need to be highly flexible and adaptable to survive and thrive. Yet, a large percentage of IT projects fail to achieve the intended objectives, go over time or over budget. The capability to successfully manage organisational and technological change has become a core competency for IT professionals, business leaders and project managers.

This unit has been specifically developed for IT professionals, project managers, and senior managers to equip them with the knowledge and tools needed to ensure that IT projects remain on track to achieving the intended objectives on time and on budget. The course presents the key theories, concepts and findings in the context of academic research and change management practice. The objective is to allow participants to critically assess academic theories and methodological practice and devise interventions and actions that allow the successful management of IT initiatives.

For more information on units of study visit CUSP.

Project Management and Project Leadership

Master of Project Management

The Master of Project Management is designed for professionals seeking the project management skills needed to manage large, complex projects at the operational level.

It provides a sound preparation for a career in project management.

Master of Project Leadership

The Master of Project Leadership is designed for experienced project managers and executives seeking to better equip themselves to lead large complex projects at the strategic level across an organisation.

An innovative and challenging program, it develops strategic thinking and questions the traditional concepts of leadership, management, governance, risk and sustainability.

Master of Project Leadership

Course overview

The Master of Project Leadership looks at the skills required to establish and tailor sophisticated interdependent project frameworks, as well as exploring concepts of open systems innovation, dynamic social networks and design thinking.

The MPL will broaden and strengthen the analytical skills necessary to articulate change and enable adaptation in today's fast-changing global, political, technological and information environments.

Through the application of a range of relevant models and theories, the MPL deepens your understanding of the dynamics of delivery, adaptation and change, and of managing the connected complexities of decision making.

For more information on units of study and degree program requirements visit CUSP (http://cusp.sydney.edu.au).

Project Leadership

Graduate Certificate in Project Leadership

Graduate Diploma in Project Leadership

Master of Project Leadership

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
GCPRJLEA-01	Graduate Certificate in Project Leadership
GNPRJLEA-01	Graduate Diploma in Project Leadership
MAPRJLEA-01	Master of Project Leadership

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 Leadership
(b) the Graduate Diploma in Project Leadership
(c) the Master of Project Leadership
(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 Leadership requires:
(a) minimum of 5 years work experience with a middle to senior project management position or similar; and
(b) a Bachelor degree in any discipline with a credit average or a qualification that is acceptable to the Faculty for entry to the Graduate Certificate program.
(3) Admission to the Graduate Diploma of Project Leadership requires:
(a) minimum of 5 years work experience with a middle to senior project management position or similar; and
(b) a bachelor's degree from the University of Sydney or equivalent qualification; or
(c) completion of the embedded Graduate Certificate of Project Leadership with a minimum of credit average.
(4) Admission to the Master of Project Leadership requires:
(a) minimum of 5 years work experience with a middle to senior project management position or similar; and
(b) a bachelor's degree from the University of Sydney or equivalent qualification; or
(c) completion of the embedded Graduate Diploma of Project Leadership with a minimum credit average.
(5) All candidates who receive an offer of admission may be required to attend an interview with the Program Director before commencement.
(6) All enrolled students must complete a Professional Development Plan within their first semester of candidature.
(7) 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 Leadership / Graduate Diploma of Project Leadership / Master of Project Leadership.
(2) To qualify for the award of the Graduate Certificate in Project Leadership a candidate must complete a set structure of 24 credit points as defined in the degree table.
(3) To qualify for the award of the Graduate Diploma in Project Leadership, a candidate must complete a set structure of 36 credit points as defined in the degree table.
(4) To qualify for the award of the Master of Project Leadership, a candidate must complete a set structure of 48 credit points as defined in the degree table.

7 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.

8 Satisfactory progress

Progression is subject to the Coursework Rule. Failing to comply with the progression rule may lead to Show Cause which could lead to a change in candidature.

9 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.

10 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2012 and students who commenced their candidature prior to 1 January, 2012 who elect to proceed under these resolutions.

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Project Leadership			
Candidates for the Master of Project Leadership complete 48 credit points of units of study including 36 credit points of Core units and 12 credit points of Elective units. Candidates admitted to the Graduate Diploma or Graduate Certificate, after completing the requirements, may proceed to the Master of Project Leadership by achieving a Credit (65%) average or above.			
Core units			
Candidates complete 36 credit points of Core units.			
PMGT5875 **Project Innovation Management**	6		Semester 1 Semester 2
PMGT5891 **Project Risk Management**	6		Semester 1 Semester 2
PMGT5896 **Sustainability & Intelligence in P. M.**	6	*Note: Department permission required for enrolment*	Semester 2
PMGT5897 **Disaster Project Management**	6	*Note: Department permission required for enrolment*	Semester 2
PMGT5860 **Project Leadership Thesis A**	6	*Note: Department permission required for enrolment* *It is expected that the project will be conducted over two consecutive semesters although the two 6 credit point units PMGT5860 & PMGT5861 may be undertaken concurrently.*	Semester 1 Semester 2
PMGT5861 **Project Leadership Thesis B**	6	*Note: Department permission required for enrolment* *It is expected that the project will be conducted over two consecutive semesters although the two 6 credit point units PMGT5860 & PMGT5861 may be undertaken concurrently.*	Semester 1 Semester 2
Elective units			
Candidates are required to select 6 credit points of the following:			
PMGT5876 **Strategic Delivery of Change**	6	**N** WORK6026	Semester 1 Semester 2
WORK6026 **Organisational Change and Development**	6		Semester 2
Candidates are required to select 6 credit points of the following:			
PMGT5898 **Complex Project Leadership**	6	**N** WORK6130 *Note: Department permission required for enrolment*	Semester 1
WORK6130 **Leadership in Organisations**	6	**N** ECOF5807, ECOF6090	Semester 1
Exchange units			
Exchange units may be taken as Core or Elective units with the approval of the Program Director.			
ENGG5231 **Engineering Graduate Exchange A**	6		Intensive January Intensive July
ENGG5232 **Engineering Graduate Exchange B**	6		Intensive January Intensive July
Graduate Diploma in Project Leadership			
Candidates for the Graduate Diploma in Project Leadership complete 36 credit points of units of study. Candidates admitted to the Graduate Diploma, after completing 24 credit points, may proceed to the Master of Project Leadership by achieving a Credit (65%) average or above.			
Core units			
Candidates take 24 credit points of Core units.			
PMGT5875 **Project Innovation Management**	6		Semester 1 Semester 2
PMGT5891 **Project Risk Management**	6		Semester 1 Semester 2
PMGT5896 **Sustainability & Intelligence in P. M.**	6	*Note: Department permission required for enrolment*	Semester 2
PMGT5897 **Disaster Project Management**	6	*Note: Department permission required for enrolment*	Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Elective units			
Candidates are required to select 6 credit points of the following:			
PMGT5876 **Strategic Delivery of Change**	6	**N** WORK6026	Semester 1 Semester 2
WORK6026 **Organisational Change and Development**	6		Semester 2
Candidates are required to select 6 credit points of the following:			
PMGT5898 **Complex Project Leadership**	6	**N** WORK6130 *Note: Department permission required for enrolment*	Semester 1
WORK6130 **Leadership in Organisations**	6	**N** ECOF5807, ECOF6090	Semester 1
Graduate Certificate in Project Leadership			
Candidates for the Graduate Certificate in Project Leadership complete 24 credit points of units of study. Candidates admitted to the Graduate Certificate, after completing the requirements, may proceed to the Master of Project Leadership by achieving a Credit (65%) average or above.			
Core unit			
PMGT5896 **Sustainability & Intelligence in P. M.**	6	*Note: Department permission required for enrolment*	Semester 2
Elective Core units			
Candidates select 6 credit points of Elective Core units.			
PMGT5898 **Complex Project Leadership**	6	**N** WORK6130 *Note: Department permission required for enrolment*	Semester 1
WORK6130 **Leadership in Organisations**	6	**N** ECOF5807, ECOF6090	Semester 1
Elective units			
Candiates select a minimum of 12 credit points of Elective units.			
PMGT5875 **Project Innovation Management**	6		Semester 1 Semester 2
PMGT5876 **Strategic Delivery of Change**	6	**N** WORK6026	Semester 1 Semester 2
PMGT5891 **Project Risk Management**	6		Semester 1 Semester 2
WORK6026 **Organisational Change and Development**	6		Semester 2

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Project Management

To qualify for the award of the Master of Project Management a candidate must complete 72 credit points including:(a) 24 credit points of Project Management Core Foundation units of study;(b) 24 credit points of Project Management Core Competency units of study;(c) 12 credit points of Research/Capstone units of study; and (d) 12 credit points of Elective units of study.(e) If a reduction in the volume of learning of 24 credit points is given, the candidate must complete a minimum of 24 credit points of core Project Management competency units of study, 12 credit points of research/capstone units of study, and 12 credit points of elective units of study.(f) Candidates may complete a major in one of the areas listed below.Completion of a major is not a requirement of the Master of Project Management. A major requires the completion of 12 credit points from the units of study listed in the table for that major. The majors available are:(a) Behavioural Project Economics(b) International Project Design(c) Risk Dynamics and Resilience(d) Portfolio and Concurrency ManagementTo qualify for the award of the Graduate Diploma in Project Management a candidate must complete 48 credit points, including:(a) the 24 credit points of Project Management Core Foundation units of study;(b) PMGT5871 and PMGT5872; (c) and 12 credit points of Project Management Core Competency or Elective units of study.To qualify for the award of the Graduate Certificate in Project Management a candidate must complete 24 credit points, comprising the four Project Management Core Foundation units of study.

Project Management Core Foundation units

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hrs/week; E-Learning 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.

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 expertis.

ENGG5811
Critical and Systems Thinking

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 3 hrs/week. May also be offered online. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Critical & Systems Thinking is the first of a two unit sequence dealing with the analytical abilities required in deciding and communicating management strategy for complex large-scale projects.

The unit develops skills in making basic critical judgments on complex problem situations involving uncertainty, incomplete information and dynamically interacting technical and non- technical systems and contexts. There is a particular focus on the ability to articulate a critical, reflected and well- reasoned response at a level that contributes usefully to project strategy discussions.

The unit is pitched at the level of Associate to Practitioner (Levels 2 to 3) on the Project Management Learning Progression Table, addressing the critical thinking and systems thinking dimensions of Project Communication and Project Development. At this level, you are not necessarily expected to produce fully researched and optimised solutions to the problems posed, but you do need to be able to clearly define the main problem at hand, organise and filter relevant evidence and issues, identify and evaluate logical connections, recognise critical assumptions and uncertainties, reach well-reasoned conclusions, develop and reflect on your own personal views and present critical arguments in a constructive manner to colleagues and supervisors. These abilities are essential for an understanding of the relevance of epistemological and ontological considerations in relation to the broader, more thoroughgoing analysis of complex system dynamics to be developed in other advanced Project Management units.

ENGG5820
Applied Project Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hours per week **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

TThis UoS provides students with the opportunity to gain hands on, practical experience managing all aspects of a live project. It complements ENGG5205 Professional practice in Project Management which introduces students to standard project management processes and key knowledge areas. Working in teams, students will be given the opportunity to apply this knowledge to the execution of a project under the guidance of a senior project management professional. The primary focus is on the execution, monitoring and control and closing process groups.

Students will facilitate workshops on scoping and risk identification, and update the project plan in response to change requests or variations. They will be required to report and present on project status and to complete a post project review to identify lessons learned and improvements for future projects. Under the guidance of a senior project management professional, students will be guided through the lifecycle of a project and learn about real world practices and techniques. They will have time in most sessions to work on their assessment tasks whilst receiving guidance and immediate feedback on their progress. Effective project teamwork is fundamental to project performance and will be an important aspect of the subject.

Working as part of a team, students select from a range of meaningful projects that will enhance the reputation of the project management profession and provide genuine value to the Faculty. Teams will be responsible for developing the key project management deliverables and executing the project, including the -

oproject charter, scope statement and delivery approach

oproject schedule and project budget

oproject stakeholder and communication plan

oproject quality plan

ostatus reports and sponsor updates

oproject control logs - assumptions, risks, decisions, change requests

opost implementation review

Students will deliver a presentation to sponsors and approval committees; facilitate workshops on scoping and risk identification; and prepare a change impact assessment in response to a change request or variation. Students will be required to present on project status each fortnight and to complete a post implementation review to identify lessons learned and improvements for future projects. Students will have time in most sessions to work on their assessment tasks whilst receiving guidance and immediate feedback on their progress.

PMGT6867
Quantitative Methods: Project Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1.75 hrs/week; Tutorial 1.25 hrs/week. **Assumed knowledge:** Expect the basic understanding of the organisational context of projects and limited experience of working in a project team. Also, familiarity of different quantitative methods applied in the context of different project environments. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Online

Methods studied in this unit are used in a wide range of project management tasks and problems. The unit explains why and where particular methods are used and provides examples and opportunities to apply these methods in practice. This UoS will also facilitate the understanding of the mechanics of these methods and their underlying theory.

Project Management Core Competency units

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

PMGT5872
People and Leadership

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

This unit is delivered in multiple modes. Please ensure that the correct mode is selected before checking the detailed content. The modes are categorised in the following way:

Semester 1 = weekly delivery

Semester 1a = online delivery

Semester 1f = block delivery

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:

oProject context

oPersonal Competence

oInterpersonal Competence

oTeam 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 (PMBOKÂ® Guide)

PMGT5873
Project Economics and Finance

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 10 hrs; Tutorial 4 hrs. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

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

PMGT5891
Project Risk Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** E-Learning 3 hrs. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

This unit is delivered in multiple modes. Please ensure that the correct mode is selected before checking the detailed content. The modes are categorised in the following way:

Semester 1 = weekly delivery

Semester 1a = online delivery

Semester 1f = block delivery

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 to understand 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

Project Management Electives

PMGT5875
Project Innovation Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 10 hrs; Tutorial 4 hrs. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

This course focus on the impact of innovation into the project management practice. Important trends in innovation in project organisation, management and delivery are identified and their implications for project management explored. Major topics include: trends, such as ``open source``model 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 tools and methodologies based on an user driven approach; distribution of innovation over many independent but collaborating actors; and the importance of diverse thinking toolkits(for example: design thinking, systems thinking, integrative thinking, and hybrid thinking) that empower users to innovate for themselves.

PMGT5876
Strategic Delivery of Change

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 16 hrs. May also be offered in block mode. **Prohibitions:** WORK6026 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

Welcome to PMGT5876 Strategic Delivery of Change. This course is designed to foster and promote critical thinking and the application of good theory to inform good practice in the strategic delivery of organisational change. The philosophy underpinning this course is design thinking. You will learn quite a bit about this idea over the duration of the course, and why it is increasingly important to change management. The course develops capabilities that will differentiate you from the average project manager and change agent, and which are in high demand in forward thinking organisations.

PMGT5877
Management of Project Organisations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Reading online 4 hrs; Online discussion 2 hrs; Group Assignment 2 hrs. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

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, ITC 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 of a case study team assignment, quizzes and online discussions.

PMGT5879
Strategic Portfolio & Program Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

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.

PMGT5886
System Dynamics Modelling for PM

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Computer-Aided Project Management builds a bridge from the genesis of project management principles through today`s software, developing a postmodern project management systems 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 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.

PMGT5888
Global Project Management

Credit points: 6 **Session:** Intensive January, Semester 1, Semester 2 **Classes:** Block Mode: Lecture 10 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **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.

PMGT5889
Integrated Cost and Scheduling Control

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Block Mode: Lecture 10 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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)

PMGT5895
Contracts Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture/Tutorial 3 hrs/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Online

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.

Electives may be taken in Semester 1 or Semester 2.Master of Project Management candidates may choose the following Project Leadership units as Electives if they meet the requirement of 5 years' relevant industry experience. Special permission is required for enrolment - you will be asked to provide a CV.

PMGT5896
Sustainability & Intelligence in P. M.

Credit points: 6 **Session:** Semester 2 **Classes:** Workshop 16 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

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. Also, the concepts of sustainability and corporate responsibility are also gaining importance in our globalised economy and are having and increasing influence business and project objectives and it is becoming imperative that they are incorporated into the practice of project management.

This unit of study embraces this new reality by providing students with an expanded understanding of value creation and how this is delivered through projects. The emphasis is on using projects to deliver value in terms of economic capital whilst also developing social capital and preserving natural capital via the incorporation of sustainability principles into the practice of project management.

Students will be introduced to the sophisticated concepts of emotional intelligence, sustainability and knowledge management and apply these concepts via developing diagnostic frameworks; the preparation of recommendation reports; developing tailored project management deliverables; conducting research and analysis; and presenting on related topics.

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. And will also be given the opportunity to undertake a detailed self-development exercise with the aid of an assessment instrument and a professional coach.

PMGT5897
Disaster Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture/tutorial 8 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment.

This unit identifies the causes of some well-known disasters (natural, man-made and projects) 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 1 **Classes:** Lecture/tutorial 8 hrs; Tutorial 4 hrs. May also be offered online. **Prohibitions:** WORK6130 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

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 systems thinking will assist project managers and leadership teams in formulating approaches to management and leadership of challenging and large-scale initiatives. The expected outcomes of this unit include: Exploring how systems thinking and complexity theories 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 a range of systems thinking approaches and management modelling techniques to determine the most effective approach to managing all aspects of a project based on the level of complexity involved.

Research and Capstone units

All Master of Project Management candidates must complete a Capstone (12 credit points), Thesis (12 credit points), or Dissertation option (24 credit points), comprising those units listed under the relevant heading below.

Capstone units

ENGG5812
Critical Project Capability Assessment

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 3 hrs/week; Workshop & Panel Assessment 7 hrs. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

This unit develops skills in critically evaluating different project management methods and tools in relation to the complex systems environments that they are required to manage. Students will work on project case studies and be given the opportunity to consider different contemporary project delivery frameworks and methodologies including Lean Six Sigma, the PMBoK Project Lifecycle, Agile methods and others.

The unit targets the higher analytical capabilities required at Practitioner to Manager levels (Levels 3 to 4) on the Project Management Learning Progression Table, addressing the critical thinking and systems thinking dimensions of Project Methods, Project Development, Project Communication and Project Delivery. The distinguishing quality of thinking at this level is its systematic character, working from a broad-based theoretical and practical understanding of the project delivery environment.

The aim at this level is not only to formulate reasonable and critical responses to a given problem, but also to articulate thorough and conclusive assessments for the development of tailored project delivery approaches that combine elements from different project delivery systems and methodologies. You need to identify key elements of the project and organise them into a coherent and persuasive argument about the recommended project delivery approach, encompassing consideration of the various risks, benefits, costs and processes involved.

The unit builds upon the skills of complex problem analysis developed at a more basic level in Critical & Systems Thinking and together with this unit forms a two-part sequence dealing with the analytical abilities required in determining specific project delivery approaches for complex projects with different characteristics. Students enrolling in this unit are expected to have already developed a basic level of ability in forming and communicating critical judgments regarding complex problem situations through completion of the Critical & Systems Thinking unit or equivalent.

PMGT5850
Project Management Capstone Project

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project work in own time; Meeting 1 hour per week. **Prerequisites:** ENGG5205 AND ENGG5811 AND PMGT6867 AND ENGG5820 AND ENGG5812 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The capstone project aims to provide students with the opportunity to carry out a defined piece of independent workplace related research and assessment in a way that fosters the development of practical research skills relevant to project management. Students will work individually or in small groups on an assigned project for the semester. The concepts covered depend on the nature of the project. The capstone project will be undertaken in conjunction with ENGG5812 Project Capability Assessment, building on the skills of complex problem analysis developed in the preceding unit. The project outcomes will be presented in a report that is clear, coherent and logically structured. The project 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, in understanding the business or organisational context and needs. Students will also be required to present the results of their findings to their peers and supervisors either face to face or by production of a video or other recorded presentation. The skills acquired will be invaluable to students progressing their careers in project management work. Students are expected to take the initiative when pursuing their capstone projects.

Thesis units

PMGT5883
Project Management Thesis A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 10 hrs; Meeting, **Prohibitions:** PMGT5892 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: It is expected that the project will be conducted over two consecutive semesters although the two 6 credit point units PMGT5883 & PMGT5884 may be undertaken concurrently. Students must have a 75% average WAM and approval from the Program Director to be eligible to enrol in this unit. . Students considering this option should discuss it with the Thesis coordinator at least one semester before they intend to start.

Project Management Thesis A & B provide an opportunity for students to undertake a major project in a specialised area relevant to Project Management. Students will work individually to plan and write reports

Project Management Thesis can be spread over a whole year, in two successive Units of Study of 6 credits points each, Project Management Thesis A (PMGT5883) and Project Management Thesis B (PMGT5884). This particular unit of study, which must precede PMGT5884 Project Management Thesis B, should cover the first half of the work required for a complete 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.

PMGT5884
Project Management Thesis B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting, Project Work - own time 10 hrs. **Prohibitions:** PMGT5892 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: It is expected that the project will be conducted over two consecutive semesters although the two 6 credit point units PMGT5883 & PMGT5884 may be undertaken concurrently. Students must have a 75% average WAM and approval from the Program Director to be eligible to enrol in this unit. Students considering this option should discuss it with the Thesis coordinator at least one semester before they intend to start.

Project Management Thesis A & B provide an opportunity for students to undertake a major project in a specialised area relevant to Project Management. Students will work individually to plan and write reports.

Project Management Thesis can be spread over a whole year, in two successive Units of Study of 6 credits points each, Project Management Thesis A (PMGT5883) and Project Management Thesis B (PMGT5884). This particular unit of study, which must be preceded by or be conducted concurrently with PMGT5883 Project Management Thesis A, should cover the second half of the work required for a complete thesis project. In particular, it should include completion of all components planned but not undertaken or completed in PMGT5883 Project Management Thesis A.

Dissertation units

Enrolment in the Dissertation option is with permission only. If undertaking this option, replace 12 credit points of Elective units with Dissertation units.

PMGT5851
Project Management Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Meeting, Project Work - own time: 20.00 hours per week. **Prerequisites:** ENGG5205 AND ENGG5811 AND PMGT6867 AND ENGG5820. **Prohibitions:** PMGT5883 OR PMGT5884 OR PMGT5850 **Assessment:** Through-semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The dissertation is available to students who have a strong research interest and who are deemed capable of completing an extensive research project. The aim of the dissertation is to complete a substantial research project and successfully analyse a problem, devise appropriate research methods, analyse the results and produce a well-argued, in-depth thesis. It is expected that the dissertation will be conducted over two consecutive semesters although the two 12 credit point units PMGT5880 & PMGT5881 may, with permission, be undertaken concurrently. This unit of study, which must precede PMGT5881 Project Management Dissertation B, should cover the first half of the work required for a complete dissertation 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.

PMGT5852
Project Management Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Meeting, Project Work - own time: 20.00 hours per week. **Prerequisites:** ENGG5205 AND ENGG5811 AND PMGT6867 AND ENGG5820. **Prohibitions:** PMGT5883 OR PMGT5884 OR PMGT5850 **Assessment:** Through semester assessment (100%). **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The dissertation is available to students who have a strong research interest and who are deemed capable of completing an extensive research project. The aim of the dissertation is to complete a substantial research project and successfully analyse a problem, devise appropriate research methods, analyse the results and produce a well-argued, in-depth thesis. It is expected that the dissertation will be conducted over two consecutive semesters although the two 12 credit point units PMGT5880 & PMGT5881 may, with permission, be undertaken concurrently. This unit of study, which must be preceded by or be conducted concurrently with PMGT5880 Project Management Dissertation A, should cover the second half of the work required for a complete dissertation project. In particular, it should include completion of all components planned but not undertaken or completed in PMGT5880 Project Management Dissertation B.

Master of Project Management majors

Select 12 credit points of Electives units listed in the table for the relevant major.

Behavioural Project Economics

PMGT5886
System Dynamics Modelling for PM

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Computer-Aided Project Management builds a bridge from the genesis of project management principles through today`s software, developing a postmodern project management systems 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 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.

PMGT5889
Integrated Cost and Scheduling Control

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Block Mode: Lecture 10 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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)

PMGT5895
Contracts Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture/Tutorial 3 hrs/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Online

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.

International Project Design

PMGT5876
Strategic Delivery of Change

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 16 hrs. May also be offered in block mode. **Prohibitions:** WORK6026 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

Welcome to PMGT5876 Strategic Delivery of Change. This course is designed to foster and promote critical thinking and the application of good theory to inform good practice in the strategic delivery of organisational change. The philosophy underpinning this course is design thinking. You will learn quite a bit about this idea over the duration of the course, and why it is increasingly important to change management. The course develops capabilities that will differentiate you from the average project manager and change agent, and which are in high demand in forward thinking organisations.

PMGT5877
Management of Project Organisations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Reading online 4 hrs; Online discussion 2 hrs; Group Assignment 2 hrs. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

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, ITC 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 of a case study team assignment, quizzes and online discussions.

PMGT5888
Global Project Management

Credit points: 6 **Session:** Intensive January, Semester 1, Semester 2 **Classes:** Block Mode: Lecture 10 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **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.

PMGT5896
Sustainability & Intelligence in P. M.

Credit points: 6 **Session:** Semester 2 **Classes:** Workshop 16 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

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. Also, the concepts of sustainability and corporate responsibility are also gaining importance in our globalised economy and are having and increasing influence business and project objectives and it is becoming imperative that they are incorporated into the practice of project management.

This unit of study embraces this new reality by providing students with an expanded understanding of value creation and how this is delivered through projects. The emphasis is on using projects to deliver value in terms of economic capital whilst also developing social capital and preserving natural capital via the incorporation of sustainability principles into the practice of project management.

Students will be introduced to the sophisticated concepts of emotional intelligence, sustainability and knowledge management and apply these concepts via developing diagnostic frameworks; the preparation of recommendation reports; developing tailored project management deliverables; conducting research and analysis; and presenting on related topics.

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. And will also be given the opportunity to undertake a detailed self-development exercise with the aid of an assessment instrument and a professional coach.

Portfolio and Concurrency Management

PMGT5875
Project Innovation Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 10 hrs; Tutorial 4 hrs. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

This course focus on the impact of innovation into the project management practice. Important trends in innovation in project organisation, management and delivery are identified and their implications for project management explored. Major topics include: trends, such as ``open source``model 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 tools and methodologies based on an user driven approach; distribution of innovation over many independent but collaborating actors; and the importance of diverse thinking toolkits(for example: design thinking, systems thinking, integrative thinking, and hybrid thinking) that empower users to innovate for themselves.

PMGT5879
Strategic Portfolio & Program Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

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.

PMGT5895
Contracts Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture/Tutorial 3 hrs/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Online

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.

PMGT5898
Complex Project Leadership

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture/tutorial 8 hrs; Tutorial 4 hrs. May also be offered online. **Prohibitions:** WORK6130 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

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 systems thinking will assist project managers and leadership teams in formulating approaches to management and leadership of challenging and large-scale initiatives. The expected outcomes of this unit include: Exploring how systems thinking and complexity theories 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 a range of systems thinking approaches and management modelling techniques to determine the most effective approach to managing all aspects of a project based on the level of complexity involved.

Risk Dynamics and Resilience

PMGT5875
Project Innovation Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 10 hrs; Tutorial 4 hrs. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

This course focus on the impact of innovation into the project management practice. Important trends in innovation in project organisation, management and delivery are identified and their implications for project management explored. Major topics include: trends, such as ``open source``model 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 tools and methodologies based on an user driven approach; distribution of innovation over many independent but collaborating actors; and the importance of diverse thinking toolkits(for example: design thinking, systems thinking, integrative thinking, and hybrid thinking) that empower users to innovate for themselves.

PMGT5876
Strategic Delivery of Change

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 16 hrs. May also be offered in block mode. **Prohibitions:** WORK6026 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

Welcome to PMGT5876 Strategic Delivery of Change. This course is designed to foster and promote critical thinking and the application of good theory to inform good practice in the strategic delivery of organisational change. The philosophy underpinning this course is design thinking. You will learn quite a bit about this idea over the duration of the course, and why it is increasingly important to change management. The course develops capabilities that will differentiate you from the average project manager and change agent, and which are in high demand in forward thinking organisations.

PMGT5886
System Dynamics Modelling for PM

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

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.

PMGT5897
Disaster Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture/tutorial 8 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment.

This unit identifies the causes of some well-known disasters (natural, man-made and projects) 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.

For more information on units of study visit CUSP.

Master of Project Management

Course overview

The Master of Project Management will provide you with the advanced project management skills needed to manage large, complex projects at an operational level.

It will equip you with the fundamental methodologies, modelling and analysis skills for the design and implementation of projects applicable to a wide range of industries.

Course structure

You may choose either to major in a particular area of practice or to complete a general Master of Project Management without a major.

For more information on units of study and degree program requirements visit CUSP.

Majors

- Behavioural Project Economics
- International Project Design
- Risk Dynamics and Resilience
- Portfolio and Concurrency Management

Accreditation

The Master of Project Management has been accredited by the Project Management Institute Global Accreditation Centre for Project Management Education Programs (GAC) from the 1 February 2010 until 2017.

Project Management

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
GCPRJMGT-01	Graduate Certificate in Project Management
GNPRJMGT-01	Graduate Diploma in Project Management
MAPRJMGT-01	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 in 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 in a relevant discipline; or
(b) a Bachelor's degree with Honours from the University of Sydney or equivalent qualification in an unrelated discipline; or
(c) a combination of a Bachelor's degree from the University of Sydney or equivalent qualification and relevant industry experience and certifications; or
(d) 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, comprising the 4 core Project Management Foundation units of study.
(3) To qualify for the award of the Graduate Diploma in Project Management a candidate must complete 48 credit points, including:
(a) the 24 credit points of core Project Management Foundation units of study;
(b) PMGT5871 and PMGT5872;
(c) and 12 credit points of Project Management Competency or Elective units.
(4) To qualify for the award of the Master of Project Management, a candidate must complete 72 credit points, including:
(a) 24 credit points of core Project Management Foundation units of study;
(b) 24 credit points of core Project Management Competency units of study;
(c) 12 credit points of research/capstone units of study; and
(d) 12 credit points of elective units of study.
(e) If a reduction in the volume of learning of 24 credit points is given, the candidate must complete a minimum of 24 credit points of core Project Management competency units of study, 12 credit points of research/capstone units of study, and 12 credit points of elective units of study.
(f) Candidates may complete a major in one of the areas listed below.

7 Majors

(1) Completion of a major is not a requirement of the Master of Project Management. A major requires the completion of 12 credit points from units of study listed in the table for that major. The majors available are:

(a) International Project Design
(b) Behavioural Project Economics
(c) Risk Dynamics and Resilience
(d) Portfolio and Concurrency Management

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, 2015 and students who commenced their candidature prior to 1 January, 2015 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2015 may complete the requirements in accordance with the resolutions in force at the time of their commencement.

Unit of study table

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
Master of Project Management			
To qualify for the award of the Master of Project Management a candidate must complete 72 credit points including: (a) 24 credit points of Project Management Core Foundation units of study; (b) 24 credit points of Project Management Core Competency units of study; (c) 12 credit points of Research/Capstone units of study; and (d) 12 credit points of Elective units of study. (e) If a reduction in the volume of learning of 24 credit points is given, the candidate must complete a minimum of 24 credit points of core Project Management competency units of study, 12 credit points of research/capstone units of study, and 12 credit points of elective units of study. (f) Candidates may complete a major in one of the areas listed below. Completion of a major is not a requirement of the Master of Project Management. A major requires the completion of 12 credit points from the units of study listed in the table for that major. The majors available are: (a) Behavioural Project Economics (b) International Project Design (c) Risk Dynamics and Resilience (d) Portfolio and Concurrency Management To qualify for the award of the Graduate Diploma in Project Management a candidate must complete 48 credit points, including: (a) the 24 credit points of Project Management Core Foundation units of study; (b) PMGT5871 and PMGT5872; (c) and 12 credit points of Project Management Core Competency or Elective units of study. To qualify for the award of the Graduate Certificate in Project Management a candidate must complete 24 credit points, comprising the four Project Management Core Foundation units of study.			
Project Management Core Foundation units			
ENGG5205 **Professional Practice in PM**	6	*This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.*	Semester 1 Semester 2
ENGG5811 **Critical and Systems Thinking**	6		Semester 1 Semester 2
ENGG5820 **Applied Project Management**	6		Semester 1 Semester 2
PMGT6867 **Quantitative Methods: Project Management**	6	**A** Expect the basic understanding of the organisational context of projects and limited experience of working in a project team. Also, familiarity of different quantitative methods applied in the context of different project environments.	Semester 1 Semester 2
Project Management Core Competency units			
PMGT5871 **Project Process Planning and Control**	6		Intensive December Intensive July Semester 1 Semester 2
PMGT5872 **People and Leadership**	6		Semester 1 Semester 2
PMGT5873 **Project Economics and Finance**	6		Semester 1 Semester 2
PMGT5891 **Project Risk Management**	6		Semester 1 Semester 2
Project Management Electives			
PMGT5875 **Project Innovation Management**	6		Semester 1 Semester 2
PMGT5876 **Strategic Delivery of Change**	6	**N** WORK6026	Semester 1 Semester 2
PMGT5877 **Management of Project Organisations**	6		Semester 1 Semester 2
PMGT5879 **Strategic Portfolio & Program Management**	6		Semester 1 Semester 2
PMGT5886 **System Dynamics Modelling for PM**	6		Semester 2
PMGT5887 **Computer Applications in PM**	6		Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PMGT5888 **Global Project Management**	6		Intensive January Semester 1 Semester 2
PMGT5889 **Integrated Cost and Scheduling Control**	6		Semester 1 Semester 2
PMGT5895 **Contracts Management**	6		Semester 1 Semester 2
Electives may be taken in Semester 1 or Semester 2. Master of Project Management candidates may choose the following Project Leadership units as Electives if they meet the requirement of 5 years' relevant industry experience. Special permission is required for enrolment - you will be asked to provide a CV.			
PMGT5896 **Sustainability & Intelligence in P. M.**	6	*Note: Department permission required for enrolment*	Semester 2
PMGT5897 **Disaster Project Management**	6	*Note: Department permission required for enrolment*	Semester 2
PMGT5898 **Complex Project Leadership**	6	**N** WORK6130 *Note: Department permission required for enrolment*	Semester 1

Research and Capstone units

All Master of Project Management candidates must complete a Capstone (12 credit points), Thesis (12 credit points), or Dissertation option (24 credit points), comprising those units listed under the relevant heading below.

Capstone units

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
ENGG5812 **Critical Project Capability Assessment**	6		Semester 1 Semester 2
PMGT5850 **Project Management Capstone Project**	6	**P** ENGG5205 AND ENGG5811 AND PMGT6867 AND ENGG5820 AND ENGG5812	Semester 1 Semester 2

Thesis units

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PMGT5883 **Project Management Thesis A**	6	**N** PMGT5892 *Note: Department permission required for enrolment* *It is expected that the project will be conducted over two consecutive semesters although the two 6 credit point units PMGT5883 & PMGT5884 may be undertaken concurrently. Students must have a 75% average WAM and approval from the Program Director to be eligible to enrol in this unit. . Students considering this option should discuss it with the Thesis coordinator at least one semester before they intend to start.*	Semester 1 Semester 2
PMGT5884 **Project Management Thesis B**	6	**N** PMGT5892 *Note: Department permission required for enrolment* *It is expected that the project will be conducted over two consecutive semesters although the two 6 credit point units PMGT5883 & PMGT5884 may be undertaken concurrently. Students must have a 75% average WAM and approval from the Program Director to be eligible to enrol in this unit. Students considering this option should discuss it with the Thesis coordinator at least one semester before they intend to start.*	Semester 1 Semester 2

Dissertation units

Enrolment in the Dissertation option is with permission only. If undertaking this option, replace 12 credit points of Elective units with Dissertation units.

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PMGT5851 **Project Management Dissertation A**	12	**P** ENGG5205 AND ENGG5811 AND PMGT6867 AND ENGG5820. **N** PMGT5883 OR PMGT5884 OR PMGT5850 *Note: Department permission required for enrolment*	Semester 1 Semester 2
PMGT5852 **Project Management Dissertation B**	12	**P** ENGG5205 AND ENGG5811 AND PMGT6867 AND ENGG5820. **N** PMGT5883 OR PMGT5884 OR PMGT5850 *Note: Department permission required for enrolment*	Semester 1 Semester 2

Master of Project Management majors

Select 12 credit points of Electives units listed in the table for the relevant major.

Behavioural Project Economics

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PMGT5886 **System Dynamics Modelling for PM**	6		Semester 2
PMGT5887 **Computer Applications in PM**	6		Semester 1 Semester 2
PMGT5889 **Integrated Cost and Scheduling Control**	6		Semester 1 Semester 2
PMGT5895 **Contracts Management**	6		Semester 1 Semester 2

International Project Design

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PMGT5876 **Strategic Delivery of Change**	6	**N** WORK6026	Semester 1 Semester 2
PMGT5877 **Management of Project Organisations**	6		Semester 1 Semester 2

Unit of study	Credit points	A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition	Session
PMGT5888 **Global Project Management**	6		Intensive January Semester 1 Semester 2
PMGT5896 **Sustainability & Intelligence in P. M.**	6	*Note: Department permission required for enrolment*	Semester 2
Portfolio and Concurrency Management			
PMGT5875 **Project Innovation Management**	6		Semester 1 Semester 2
PMGT5879 **Strategic Portfolio & Program Management**	6		Semester 1 Semester 2
PMGT5895 **Contracts Management**	6		Semester 1 Semester 2
PMGT5898 **Complex Project Leadership**	6	**N** WORK6130 *Note: Department permission required for enrolment*	Semester 1
Risk Dynamics and Resilience			
PMGT5875 **Project Innovation Management**	6		Semester 1 Semester 2
PMGT5876 **Strategic Delivery of Change**	6	**N** WORK6026	Semester 1 Semester 2
PMGT5886 **System Dynamics Modelling for PM**	6		Semester 2
PMGT5897 **Disaster Project Management**	6	*Note: Department permission required for enrolment*	Semester 2

For more information on degree program requirements visit CUSP.

Unit of study descriptions

Master of Project Management

To qualify for the award of the Master of Project Management a candidate must complete 72 credit points including:(a) 24 credit points of Project Management Core Foundation units of study;(b) 24 credit points of Project Management Core Competency units of study;(c) 12 credit points of Research/Capstone units of study; and (d) 12 credit points of Elective units of study.(e) If a reduction in the volume of learning of 24 credit points is given, the candidate must complete a minimum of 24 credit points of core Project Management competency units of study, 12 credit points of research/capstone units of study, and 12 credit points of elective units of study.(f) Candidates may complete a major in one of the areas listed below.Completion of a major is not a requirement of the Master of Project Management. A major requires the completion of 12 credit points from the units of study listed in the table for that major. The majors available are:(a) Behavioural Project Economics(b) International Project Design(c) Risk Dynamics and Resilience(d) Portfolio and Concurrency ManagementTo qualify for the award of the Graduate Diploma in Project Management a candidate must complete 48 credit points, including:(a) the 24 credit points of Project Management Core Foundation units of study;(b) PMGT5871 and PMGT5872; (c) and 12 credit points of Project Management Core Competency or Elective units of study.To qualify for the award of the Graduate Certificate in Project Management a candidate must complete 24 credit points, comprising the four Project Management Core Foundation units of study.

Project Management Core Foundation units

ENGG5205
Professional Practice in PM

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hrs/week; E-Learning 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Note: This is a core unit for all Master of Professional Engineering students as well as all students pursuing Project Management studies (including Master of Project Management, Graduate Certificate in Project Management and Graduate Diploma in Project Management). No prerequisite or assumed knowledge.

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 expertis.

ENGG5811
Critical and Systems Thinking

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 3 hrs/week. May also be offered online. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Critical & Systems Thinking is the first of a two unit sequence dealing with the analytical abilities required in deciding and communicating management strategy for complex large-scale projects.

The unit develops skills in making basic critical judgments on complex problem situations involving uncertainty, incomplete information and dynamically interacting technical and non- technical systems and contexts. There is a particular focus on the ability to articulate a critical, reflected and well- reasoned response at a level that contributes usefully to project strategy discussions.

The unit is pitched at the level of Associate to Practitioner (Levels 2 to 3) on the Project Management Learning Progression Table, addressing the critical thinking and systems thinking dimensions of Project Communication and Project Development. At this level, you are not necessarily expected to produce fully researched and optimised solutions to the problems posed, but you do need to be able to clearly define the main problem at hand, organise and filter relevant evidence and issues, identify and evaluate logical connections, recognise critical assumptions and uncertainties, reach well-reasoned conclusions, develop and reflect on your own personal views and present critical arguments in a constructive manner to colleagues and supervisors. These abilities are essential for an understanding of the relevance of epistemological and ontological considerations in relation to the broader, more thoroughgoing analysis of complex system dynamics to be developed in other advanced Project Management units.

ENGG5820
Applied Project Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3 hours per week **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

TThis UoS provides students with the opportunity to gain hands on, practical experience managing all aspects of a live project. It complements ENGG5205 Professional practice in Project Management which introduces students to standard project management processes and key knowledge areas. Working in teams, students will be given the opportunity to apply this knowledge to the execution of a project under the guidance of a senior project management professional. The primary focus is on the execution, monitoring and control and closing process groups.

Students will facilitate workshops on scoping and risk identification, and update the project plan in response to change requests or variations. They will be required to report and present on project status and to complete a post project review to identify lessons learned and improvements for future projects. Under the guidance of a senior project management professional, students will be guided through the lifecycle of a project and learn about real world practices and techniques. They will have time in most sessions to work on their assessment tasks whilst receiving guidance and immediate feedback on their progress. Effective project teamwork is fundamental to project performance and will be an important aspect of the subject.

Working as part of a team, students select from a range of meaningful projects that will enhance the reputation of the project management profession and provide genuine value to the Faculty. Teams will be responsible for developing the key project management deliverables and executing the project, including the -

oproject charter, scope statement and delivery approach

oproject schedule and project budget

oproject stakeholder and communication plan

oproject quality plan

ostatus reports and sponsor updates

oproject control logs - assumptions, risks, decisions, change requests

opost implementation review

Students will deliver a presentation to sponsors and approval committees; facilitate workshops on scoping and risk identification; and prepare a change impact assessment in response to a change request or variation. Students will be required to present on project status each fortnight and to complete a post implementation review to identify lessons learned and improvements for future projects. Students will have time in most sessions to work on their assessment tasks whilst receiving guidance and immediate feedback on their progress.

PMGT6867
Quantitative Methods: Project Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 1.75 hrs/week; Tutorial 1.25 hrs/week. **Assumed knowledge:** Expect the basic understanding of the organisational context of projects and limited experience of working in a project team. Also, familiarity of different quantitative methods applied in the context of different project environments. **Assessment:** Through semester assessment (40%) Final Exam (60%) **Mode of delivery:** Online

Methods studied in this unit are used in a wide range of project management tasks and problems. The unit explains why and where particular methods are used and provides examples and opportunities to apply these methods in practice. This UoS will also facilitate the understanding of the mechanics of these methods and their underlying theory.

Project Management Core Competency units

PMGT5871
Project Process Planning and Control

Credit points: 6 **Session:** Intensive December, Intensive July, Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (60%) Final Exam (40%) **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.

PMGT5872
People and Leadership

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online and/or in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

This unit is delivered in multiple modes. Please ensure that the correct mode is selected before checking the detailed content. The modes are categorised in the following way:

Semester 1 = weekly delivery

Semester 1a = online delivery

Semester 1f = block delivery

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:

oProject context

oPersonal Competence

oInterpersonal Competence

oTeam 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 (PMBOKÂ® Guide)

PMGT5873
Project Economics and Finance

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 10 hrs; Tutorial 4 hrs. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

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

PMGT5891
Project Risk Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** E-Learning 3 hrs. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

This unit is delivered in multiple modes. Please ensure that the correct mode is selected before checking the detailed content. The modes are categorised in the following way:

Semester 1 = weekly delivery

Semester 1a = online delivery

Semester 1f = block delivery

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 to understand 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

Project Management Electives

PMGT5875
Project Innovation Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 10 hrs; Tutorial 4 hrs. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

This course focus on the impact of innovation into the project management practice. Important trends in innovation in project organisation, management and delivery are identified and their implications for project management explored. Major topics include: trends, such as ``open source``model 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 tools and methodologies based on an user driven approach; distribution of innovation over many independent but collaborating actors; and the importance of diverse thinking toolkits(for example: design thinking, systems thinking, integrative thinking, and hybrid thinking) that empower users to innovate for themselves.

PMGT5876
Strategic Delivery of Change

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 16 hrs. May also be offered in block mode. **Prohibitions:** WORK6026 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

Welcome to PMGT5876 Strategic Delivery of Change. This course is designed to foster and promote critical thinking and the application of good theory to inform good practice in the strategic delivery of organisational change. The philosophy underpinning this course is design thinking. You will learn quite a bit about this idea over the duration of the course, and why it is increasingly important to change management. The course develops capabilities that will differentiate you from the average project manager and change agent, and which are in high demand in forward thinking organisations.

PMGT5877
Management of Project Organisations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Reading online 4 hrs; Online discussion 2 hrs; Group Assignment 2 hrs. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

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, ITC 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 of a case study team assignment, quizzes and online discussions.

PMGT5879
Strategic Portfolio & Program Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

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.

PMGT5886
System Dynamics Modelling for PM

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Computer-Aided Project Management builds a bridge from the genesis of project management principles through today`s software, developing a postmodern project management systems 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 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.

PMGT5888
Global Project Management

Credit points: 6 **Session:** Intensive January, Semester 1, Semester 2 **Classes:** Block Mode: Lecture 10 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **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.

PMGT5889
Integrated Cost and Scheduling Control

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Block Mode: Lecture 10 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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)

PMGT5895
Contracts Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture/Tutorial 3 hrs/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Online

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.

Electives may be taken in Semester 1 or Semester 2.Master of Project Management candidates may choose the following Project Leadership units as Electives if they meet the requirement of 5 years' relevant industry experience. Special permission is required for enrolment - you will be asked to provide a CV.

PMGT5896
Sustainability & Intelligence in P. M.

Credit points: 6 **Session:** Semester 2 **Classes:** Workshop 16 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

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. Also, the concepts of sustainability and corporate responsibility are also gaining importance in our globalised economy and are having and increasing influence business and project objectives and it is becoming imperative that they are incorporated into the practice of project management.

This unit of study embraces this new reality by providing students with an expanded understanding of value creation and how this is delivered through projects. The emphasis is on using projects to deliver value in terms of economic capital whilst also developing social capital and preserving natural capital via the incorporation of sustainability principles into the practice of project management.

Students will be introduced to the sophisticated concepts of emotional intelligence, sustainability and knowledge management and apply these concepts via developing diagnostic frameworks; the preparation of recommendation reports; developing tailored project management deliverables; conducting research and analysis; and presenting on related topics.

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. And will also be given the opportunity to undertake a detailed self-development exercise with the aid of an assessment instrument and a professional coach.

PMGT5897
Disaster Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture/tutorial 8 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment.

This unit identifies the causes of some well-known disasters (natural, man-made and projects) 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 1 **Classes:** Lecture/tutorial 8 hrs; Tutorial 4 hrs. May also be offered online. **Prohibitions:** WORK6130 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

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 systems thinking will assist project managers and leadership teams in formulating approaches to management and leadership of challenging and large-scale initiatives. The expected outcomes of this unit include: Exploring how systems thinking and complexity theories 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 a range of systems thinking approaches and management modelling techniques to determine the most effective approach to managing all aspects of a project based on the level of complexity involved.

Research and Capstone units

All Master of Project Management candidates must complete a Capstone (12 credit points), Thesis (12 credit points), or Dissertation option (24 credit points), comprising those units listed under the relevant heading below.

Capstone units

ENGG5812
Critical Project Capability Assessment

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 3 hrs/week; Workshop & Panel Assessment 7 hrs. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

This unit develops skills in critically evaluating different project management methods and tools in relation to the complex systems environments that they are required to manage. Students will work on project case studies and be given the opportunity to consider different contemporary project delivery frameworks and methodologies including Lean Six Sigma, the PMBoK Project Lifecycle, Agile methods and others.

The unit targets the higher analytical capabilities required at Practitioner to Manager levels (Levels 3 to 4) on the Project Management Learning Progression Table, addressing the critical thinking and systems thinking dimensions of Project Methods, Project Development, Project Communication and Project Delivery. The distinguishing quality of thinking at this level is its systematic character, working from a broad-based theoretical and practical understanding of the project delivery environment.

The aim at this level is not only to formulate reasonable and critical responses to a given problem, but also to articulate thorough and conclusive assessments for the development of tailored project delivery approaches that combine elements from different project delivery systems and methodologies. You need to identify key elements of the project and organise them into a coherent and persuasive argument about the recommended project delivery approach, encompassing consideration of the various risks, benefits, costs and processes involved.

The unit builds upon the skills of complex problem analysis developed at a more basic level in Critical & Systems Thinking and together with this unit forms a two-part sequence dealing with the analytical abilities required in determining specific project delivery approaches for complex projects with different characteristics. Students enrolling in this unit are expected to have already developed a basic level of ability in forming and communicating critical judgments regarding complex problem situations through completion of the Critical & Systems Thinking unit or equivalent.

PMGT5850
Project Management Capstone Project

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project work in own time; Meeting 1 hour per week. **Prerequisites:** ENGG5205 AND ENGG5811 AND PMGT6867 AND ENGG5820 AND ENGG5812 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

The capstone project aims to provide students with the opportunity to carry out a defined piece of independent workplace related research and assessment in a way that fosters the development of practical research skills relevant to project management. Students will work individually or in small groups on an assigned project for the semester. The concepts covered depend on the nature of the project. The capstone project will be undertaken in conjunction with ENGG5812 Project Capability Assessment, building on the skills of complex problem analysis developed in the preceding unit. The project outcomes will be presented in a report that is clear, coherent and logically structured. The project 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, in understanding the business or organisational context and needs. Students will also be required to present the results of their findings to their peers and supervisors either face to face or by production of a video or other recorded presentation. The skills acquired will be invaluable to students progressing their careers in project management work. Students are expected to take the initiative when pursuing their capstone projects.

Thesis units

PMGT5883
Project Management Thesis A

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Project Work - own time 10 hrs; Meeting, **Prohibitions:** PMGT5892 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: It is expected that the project will be conducted over two consecutive semesters although the two 6 credit point units PMGT5883 & PMGT5884 may be undertaken concurrently. Students must have a 75% average WAM and approval from the Program Director to be eligible to enrol in this unit. . Students considering this option should discuss it with the Thesis coordinator at least one semester before they intend to start.

Project Management Thesis A & B provide an opportunity for students to undertake a major project in a specialised area relevant to Project Management. Students will work individually to plan and write reports

Project Management Thesis can be spread over a whole year, in two successive Units of Study of 6 credits points each, Project Management Thesis A (PMGT5883) and Project Management Thesis B (PMGT5884). This particular unit of study, which must precede PMGT5884 Project Management Thesis B, should cover the first half of the work required for a complete 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.

PMGT5884
Project Management Thesis B

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Meeting, Project Work - own time 10 hrs. **Prohibitions:** PMGT5892 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment. Note: It is expected that the project will be conducted over two consecutive semesters although the two 6 credit point units PMGT5883 & PMGT5884 may be undertaken concurrently. Students must have a 75% average WAM and approval from the Program Director to be eligible to enrol in this unit. Students considering this option should discuss it with the Thesis coordinator at least one semester before they intend to start.

Project Management Thesis A & B provide an opportunity for students to undertake a major project in a specialised area relevant to Project Management. Students will work individually to plan and write reports.

Project Management Thesis can be spread over a whole year, in two successive Units of Study of 6 credits points each, Project Management Thesis A (PMGT5883) and Project Management Thesis B (PMGT5884). This particular unit of study, which must be preceded by or be conducted concurrently with PMGT5883 Project Management Thesis A, should cover the second half of the work required for a complete thesis project. In particular, it should include completion of all components planned but not undertaken or completed in PMGT5883 Project Management Thesis A.

Dissertation units

Enrolment in the Dissertation option is with permission only. If undertaking this option, replace 12 credit points of Elective units with Dissertation units.

PMGT5851
Project Management Dissertation A

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Meeting, Project Work - own time: 20.00 hours per week. **Prerequisites:** ENGG5205 AND ENGG5811 AND PMGT6867 AND ENGG5820. **Prohibitions:** PMGT5883 OR PMGT5884 OR PMGT5850 **Assessment:** Through-semester assessment (100%) **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The dissertation is available to students who have a strong research interest and who are deemed capable of completing an extensive research project. The aim of the dissertation is to complete a substantial research project and successfully analyse a problem, devise appropriate research methods, analyse the results and produce a well-argued, in-depth thesis. It is expected that the dissertation will be conducted over two consecutive semesters although the two 12 credit point units PMGT5880 & PMGT5881 may, with permission, be undertaken concurrently. This unit of study, which must precede PMGT5881 Project Management Dissertation B, should cover the first half of the work required for a complete dissertation 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.

PMGT5852
Project Management Dissertation B

Credit points: 12 **Session:** Semester 1, Semester 2 **Classes:** Meeting, Project Work - own time: 20.00 hours per week. **Prerequisites:** ENGG5205 AND ENGG5811 AND PMGT6867 AND ENGG5820. **Prohibitions:** PMGT5883 OR PMGT5884 OR PMGT5850 **Assessment:** Through semester assessment (100%). **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

The dissertation is available to students who have a strong research interest and who are deemed capable of completing an extensive research project. The aim of the dissertation is to complete a substantial research project and successfully analyse a problem, devise appropriate research methods, analyse the results and produce a well-argued, in-depth thesis. It is expected that the dissertation will be conducted over two consecutive semesters although the two 12 credit point units PMGT5880 & PMGT5881 may, with permission, be undertaken concurrently. This unit of study, which must be preceded by or be conducted concurrently with PMGT5880 Project Management Dissertation A, should cover the second half of the work required for a complete dissertation project. In particular, it should include completion of all components planned but not undertaken or completed in PMGT5880 Project Management Dissertation B.

Master of Project Management majors

Select 12 credit points of Electives units listed in the table for the relevant major.

Behavioural Project Economics

PMGT5886
System Dynamics Modelling for PM

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

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:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered online. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) day

Computer-Aided Project Management builds a bridge from the genesis of project management principles through today`s software, developing a postmodern project management systems 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 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.

PMGT5889
Integrated Cost and Scheduling Control

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Block Mode: Lecture 10 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (50%) Final Exam (50%) **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)

PMGT5895
Contracts Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture/Tutorial 3 hrs/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Online

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.

International Project Design

PMGT5876
Strategic Delivery of Change

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 16 hrs. May also be offered in block mode. **Prohibitions:** WORK6026 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

Welcome to PMGT5876 Strategic Delivery of Change. This course is designed to foster and promote critical thinking and the application of good theory to inform good practice in the strategic delivery of organisational change. The philosophy underpinning this course is design thinking. You will learn quite a bit about this idea over the duration of the course, and why it is increasingly important to change management. The course develops capabilities that will differentiate you from the average project manager and change agent, and which are in high demand in forward thinking organisations.

PMGT5877
Management of Project Organisations

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Reading online 4 hrs; Online discussion 2 hrs; Group Assignment 2 hrs. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

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, ITC 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 of a case study team assignment, quizzes and online discussions.

PMGT5888
Global Project Management

Credit points: 6 **Session:** Intensive January, Semester 1, Semester 2 **Classes:** Block Mode: Lecture 10 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **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.

PMGT5896
Sustainability & Intelligence in P. M.

Credit points: 6 **Session:** Semester 2 **Classes:** Workshop 16 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

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. Also, the concepts of sustainability and corporate responsibility are also gaining importance in our globalised economy and are having and increasing influence business and project objectives and it is becoming imperative that they are incorporated into the practice of project management.

This unit of study embraces this new reality by providing students with an expanded understanding of value creation and how this is delivered through projects. The emphasis is on using projects to deliver value in terms of economic capital whilst also developing social capital and preserving natural capital via the incorporation of sustainability principles into the practice of project management.

Students will be introduced to the sophisticated concepts of emotional intelligence, sustainability and knowledge management and apply these concepts via developing diagnostic frameworks; the preparation of recommendation reports; developing tailored project management deliverables; conducting research and analysis; and presenting on related topics.

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. And will also be given the opportunity to undertake a detailed self-development exercise with the aid of an assessment instrument and a professional coach.

Portfolio and Concurrency Management

PMGT5875
Project Innovation Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 10 hrs; Tutorial 4 hrs. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

This course focus on the impact of innovation into the project management practice. Important trends in innovation in project organisation, management and delivery are identified and their implications for project management explored. Major topics include: trends, such as ``open source``model 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 tools and methodologies based on an user driven approach; distribution of innovation over many independent but collaborating actors; and the importance of diverse thinking toolkits(for example: design thinking, systems thinking, integrative thinking, and hybrid thinking) that empower users to innovate for themselves.

PMGT5879
Strategic Portfolio & Program Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

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.

PMGT5895
Contracts Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture/Tutorial 3 hrs/week. **Assessment:** Through semester assessment (50%) Final Exam (50%) **Mode of delivery:** Online

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.

PMGT5898
Complex Project Leadership

Credit points: 6 **Session:** Semester 1 **Classes:** Lecture/tutorial 8 hrs; Tutorial 4 hrs. May also be offered online. **Prohibitions:** WORK6130 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

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 systems thinking will assist project managers and leadership teams in formulating approaches to management and leadership of challenging and large-scale initiatives. The expected outcomes of this unit include: Exploring how systems thinking and complexity theories 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 a range of systems thinking approaches and management modelling techniques to determine the most effective approach to managing all aspects of a project based on the level of complexity involved.

Risk Dynamics and Resilience

PMGT5875
Project Innovation Management

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 10 hrs; Tutorial 4 hrs. May also be offered in block mode. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

This course focus on the impact of innovation into the project management practice. Important trends in innovation in project organisation, management and delivery are identified and their implications for project management explored. Major topics include: trends, such as ``open source``model 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 tools and methodologies based on an user driven approach; distribution of innovation over many independent but collaborating actors; and the importance of diverse thinking toolkits(for example: design thinking, systems thinking, integrative thinking, and hybrid thinking) that empower users to innovate for themselves.

PMGT5876
Strategic Delivery of Change

Credit points: 6 **Session:** Semester 1, Semester 2 **Classes:** Seminar 16 hrs. May also be offered in block mode. **Prohibitions:** WORK6026 **Assessment:** Through semester assessment (100%) **Mode of delivery:** Online

Welcome to PMGT5876 Strategic Delivery of Change. This course is designed to foster and promote critical thinking and the application of good theory to inform good practice in the strategic delivery of organisational change. The philosophy underpinning this course is design thinking. You will learn quite a bit about this idea over the duration of the course, and why it is increasingly important to change management. The course develops capabilities that will differentiate you from the average project manager and change agent, and which are in high demand in forward thinking organisations.

PMGT5886
System Dynamics Modelling for PM

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture 2 hrs/week; Tutorial 1 hr/week. **Assessment:** Through semester assessment (60%) Final Exam (40%) **Mode of delivery:** Normal (lecture/lab/tutorial) evening

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.

PMGT5897
Disaster Project Management

Credit points: 6 **Session:** Semester 2 **Classes:** Lecture/tutorial 8 hrs; Tutorial 4 hrs. May also be offered online. **Assessment:** Through semester assessment (100%) **Mode of delivery:** Block mode

Note: Department permission required for enrolment.

This unit identifies the causes of some well-known disasters (natural, man-made and projects) 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.

For more information on units of study visit CUSP.

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